CONTROLS LAB. BLDG. 41

Operating and Service Manual

GOULD

GOULD BRUSH

MANUAL PART NO.
2007-8088XX-XX

2800 SERIES RECORDERS

ALL MODELS

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TABLE OF CONTENTS

SECTION	DESCRIPTION	PAGE
I	GENERAL INFORMATION	
	1.1 SCOPE	1.1
	1.2 DESCRIPTION	1.1
	1.3 MODEL NUMBERING SYSTEM	1.1
	1.4 SPECIFICATIONS	1.2
	1.5 SUPPLIES AND ACCESSORIES	1.4
II	INSTALLATION	
	2.1 GENERAL	2.1
	2.2 SERVICE UPON RECEIPT	2.1
	2.3 LINE VOLTAGE REQUIREMENTS	2.1
	2.4 ANALOG SIGNAL CONNECTIONS	2.1
	2.5 EVENT MARKER INPUTS	2.2
	2.6 REMOTE CHART DRIVE	2.2
	2.7 CHART TAKEUP INSTALLATION	2.3
	2.8 RACK MOUNTING KITS	2.3
III	OPERATION	
	3.1 GENERAL	3.1
	3.2 FRONT PANEL CONTROLS & INDICATORS	3.1
	3.3 REAR PANEL	3.2
	3.4 TIMER SETTING	3.4
IV	THEORY OF OPERATION	
	4.1 GENERAL	4.1
	4.2 MAINFRAME	4.1
	4.3 ANALOG RECORDING CHANNELS	4.3
V	TROUBLESHOOTING	
	5.1 GENERAL	5.1
	5.2 ELECTRICAL POWER MALFUNCTIONS	5.1
	5.3 CHART DRIVE MALFUNCTIONS	5.1
	5.4 WRITING SYSTEM MALFUNCTIONS	5.2
	5.5 SIGNAL MALFUNCTIONS	5.3
VI	MAINTENANCE	
	6.1 GENERAL	6.1
	6.2 CLEANING	6.1
	6.3 CHART PAPER REPLACEMENT	6.1
	6.4 INK CARTRIDGE REPLACEMENT	6.2
	6.5 PEN PRESSURE MEASUREMENT	6.3
	6.6 PEN LAPPING	6.4
	6.7 PEN REPLACEMENT	6.5
	6.8 PEN CLEANING	6.6
	6.9 CASE REMOVAL	6.6
	6.10 DRIVE ASSEMBLY REPLACEMENT	6.7
	6.11 POWER TRANSFORMER REPLACEMENT	6.7

SECTION	DESCRIPTION	PAGE
VI	MAINTENANCE (Continued)	
	6.12 TABLE ASSEMBLY REPLACEMENT	6.8
	6.13 MANIFOLD ASSEMBLY REPLACEMENT	6.8
	6.14 PENMOTOR REPLACEMENT	6.8
	6.15 REPLACING PENMOTOR DRIVE BAND (685270)	6.9
	6.16 MANIFOLD BLEEDING PROCEDURE	6.10
VII	CALIBRATION	
	7.1 GENERAL	7.1
	7.2 TEST EQUIPMENT REQUIRED	7.1
	7.3 PRELIMINARY SETUP	7.1
	7.4 CALIBRATION PROCEDURE	7.1
VIII	PARTS IDENTIFICATION	
	8.1 GENERAL	8.1
	8.2 PARTS USED ON OTHER MODELS	8.1

LIST OF ILLUSTRATIONS

FIGURE	DESCRIPTION	PAGE
1-1	Gould 2800 Series Recorder	1.1
1-2	Outline Dimensions – 2800 Series	1.6
1-3	Outline Dimensions – 2800 Series with Preamps	1.6
1-4	Outline Dimensions – 2800 Rack Mount	1.7
2-1	Signal Input Connections	2.1
2-2	Rear Panel Terminal Connections	2.2
2-3	Chart Takeup Installation	2.3
3-1	Front Panel Controls & Indicators	3.1
3-2	Rear Panel	3.3
4-1	Basic Recorder Block Diagram	4.1
4-2	Analog Channel Block Diagram	4.4
6-1	Paper Roll Removal	6.1
6-2	Changing Chart Paper	6.2
6-3	Paper Threading Diagram	6.2
6-4	Ink Cartridge Replacement	6.3
6-5	Ink Cartridge Assembly	6.3
6-6	Pen Pressure Measurement	6.3
6-7	Pen Pressure Adjustment	6.4
6-8	Pen Lapping	6.4
6-9	Pen Replacement	6.5
6-10	Hypodermic Needle Modification	6.6
6-11	Penmotor Drive Band Replacement	6.9
6-12	Bleeding The Inking System	6.10
7-1	Calibration Controls	7.1

LIST OF ILLUSTRATIONS (Continued)

FIGURE	DESCRIPTION	PAGE
8-1	2800 Series Recorder, Portable	8.3
8-2	2800 Series Recorder, Rack Mounted Models	8.5
8-3	Recorder Assembly (2-Sheets)	8.10 & 8.11
8-4	Switchboard Assembly	8.13
8-5	Left Hand Plate Assembly	8.15
8-6	Connector Assembly	8.17
8-7	Drive Amplifier Board Assembly	8.21 & 8.22
8-8	Control Timer Board Assembly	8.24
8-9	Chassis Assembly	8.26
8-10	Drive Assembly	8.28
8-11	Penmotor Bar Assembly	8.30
8-12	Writing Table Assembly	8.32
8-13	Sensor Assembly	8.33
8-14	Bracket Assembly, Shield	8.35
8-15	Right Hand Plate Assembly	8.37
8-16	Brake Assembly	8.38
8-17	Case Assembly	8.40
8-18	Preamp Cage Assembly	8.42
8-19	Preamp Cage Assembly, Rear	8.44
8-20	Rack Mount Installation Instructions	8.46
8-21	Preamp Cage Installation Instructions	8.48
8-22	Chart Takeup Assembly	8.50

LIST OF TABLES

TABLE	DESCRIPTION	PAGE
1-1	2800 Series Model Numbering System	1.5
3-1	Switch Settings vs Timer Repetition Rate for Various Power Line Frequencies	3.4
4-1	Chart Speed vs Solenoid Activation	4.2
4-2	Fuse vs Protected Circuit	4.2
8-1	2800 Series Recorder Fuse Table	8.9

SECTION I

GENERAL INFORMATION

1.1 SCOPE

This manual describes the Gould 2800 Series Analog Recorder (Figure 1-1), and provides instructions for installation, operation, troubleshooting, and maintenance. Theory of operation and calibration procedures are also provided. An illustrated parts breakdown is located in the rear of the manual.

Instructions for preamplifiers which may be used with these recorders are contained in their own applicable instruction manuals.

1.2 DESCRIPTION

The 2800 Series Recorder is a high performance analog recorder. It is a self-contained unit housed in a 380mm mainframe chassis to accomodate 8 isolated recording channels. Each recording channel incorporates frictionless feedback sensors for closed loop control of the pen at high speeds.

Standard to each model are chart speeds of 5, 10, 25, 50, 100, and 200 millimeters per second plus a divide by 100 or 60 (as ordered) for each writing speed. All chart writing speeds are electrically selected by pushbuttons on the front panel. Two standard event markers are provided and are located between channels 1 and 2, and 7 and 8.

The 2800 Series Recorder uses a pressurized ink writing system. The system uses fast drying ink which is applied to specially coated chart paper. The ink is contained in disposable plastic cartridges which can be replaced in minutes. Pen motion is rectilinear.

1.3 MODEL NUMBERING SYSTEM

The model number of the 2800 Series Recorder designates mounting type, chassis (mainframe) size, number of recording channels, preamplifier cage configuration, type of writing system and variations. The table on the page that follows "Specifications", and "Supplies and Accessories", describes the 2800 Series model numbering system. Appropriate recorder outline dimensionals accompany the model numbering table.

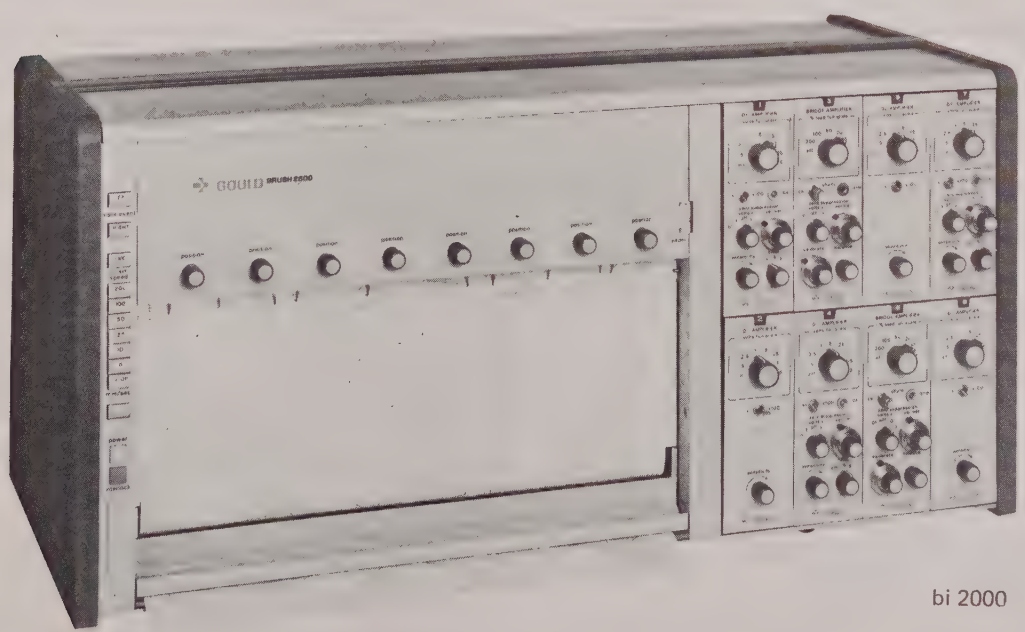


FIGURE 1-1 GOULD 2800 SERIES RECORDER

1.4 SPECIFICATIONS

a. General

Number of Analog Channels	Eight.
Number of Event Marker Channels	Two. Additional are Optional.
Channel Span	40mm.
Trace Presentation	Rectilinear.
Trace Width	0.01 inch nominal at 5mm/sec chart speed.
Marking Method	Pressured ink.
Marking Fluid Capacity	Two one-ounce replaceable throw away cartridges (sufficient for one year under normal operation).
Chart Speeds	5, 10, 25, 50, 100, and 200 mm/sec plus divide by 60 or 100.
Chart Speed Accuracy	±0.5% at nominal line frequency.
Chart Length	275 feet (83.3 meters).
Chart Width	380mm.
Divisions per Channel	50 Divisions on 40 mm Channels.
Servo Writing System Stiffness	100 grams per division.
Time Lines	Every mm, accentuated at 5 and 100mm.
Chart Travel Direction	Top to Bottom.
Paper Discharge	Front
Chart Wander	±0.25 mm
Operating Temperature Range	0° to +50°C (+32° to +122°F). Recorder will remain within specification over a range of ±10°C from temperature of calibration.
Storage Temperature Range	-40° to +70°C (-40° to +158°F).
Humidity	95% at 32°C (+90°F) Non-Condensing.
Vibration and Shock	Standard Commerical Practice.
Principle Dimensions	Refer to Outline Dimensions (Following Model Numbering System Table).

Weight:

Recorder	80 lbs.
Portable Case	19 lbs.
Preamp Cage (w/preamps)	16 lbs. (approx.)

1.4 SPECIFICATIONS (Cont'd)

b. Electrical

Input Circuit ..... Single ended, floating (isolated from ground)

Input Impedance ..... 100K ohms ±1% (Recorder without Preamplifiers)

Input Signal ..... ±2.5V for full scale (Recorder without Preamplifiers)

Frequency Response ..... At 40 millimeter amplitude: dc to 60Hz ±1div.
At 10 division amplitude: dc to 125Hz ±1div., less than 3dB down at 140Hz.

Rise Time (10% to 90% full scale with less than 1% overshoot) ..... At 40 millimeter amplitude: less than 4 milliseconds.

Input Connectors to Drive Amplifiers ..... 3-conductor phone plug:
Tip = signal high
Ring = signal low
Sleeve = shield

Non-Linearity ..... ±0.35% of full scale.

Pen Position Control ..... Infinitely adjustable ±5 volts d-c. One per channel.

Maximum Allowable Signal Input Voltage to Avoid Damage ..... ±50 volts dc or peak ac (recorder without preamplifiers).

Maximum Safe Common Mode Voltage ..... 500 volts dc or peak ac.

Common Mode Rejection Ratio ..... 60dB at 50Hz (R_s = 1 kilohm, without preamplifiers).
80 dB at dc (R_s = 1 kilohm, without preamplifiers).

Signal Limiters ..... Built-in mechanical and adjustable electronic.

Zero-Line Instability (Drift) After 15 Minute Warm-up ..... ±0.1% of full scale for 24 hours
±0.025% of full scale per ° C
±0.10% of full scale for +10% line voltage change

Gain Instability ..... ±0.1% of reading for 24 hours
±0.05% of reading per ° C
±0.05% of reading for +10% line voltage change

Remote Chart Drive Start/Stop (Standard on all Recorders) ..... Actuated by an external switch closure at any preselected chart speed.

Internal Timer (Standard on all Recorders) ..... Produces 10 millisecond duration pulses at programmable repetition rates depending upon line frequency as follows:

Line Frequency	Programmable Repetition Rates
50 or 60Hz	0.1, 1, 10 and 100 second; 0.01, 0.1 and 1 minute
400Hz	0.1, 1 and 10 second; 0.001, 0.01 and 0.1 minute

Input power ..... 60Hz and 50Hz Models: 650VA (500W)
400Hz Models: 800VA (630W)

1.5 SUPPLIES and ACCESSORIES

a. Supplies

Chart Paper, 8-40mm channels (Semi-perforated with optical sensing marks and page numbers) 11-2983-301

Analog Pen (ink tube included) 11-2823-35

Event Marker Pen (ink tube included) 11-2873-20

Ink Cartridge (Blue Ink) 11-2730-01

Gram Gage 240601-910

b. Accessories

Starter Kit 11-6250-15
Starter Kit includes 12 rolls of 8-40mm channel, semi-perforated high contrast chart paper, gram gage, one analog pen, lapping paper and pen adjustment wrench.

Rack Mounting Kit, Recorder 11-1202-14
Kit to convert portable Gould 2800 Recorder only for rack mounting. (Preamp frame not included).

Rack Mounting Kit 4600 Series Preamplifiers 11-1202-15
Harness to Recorder included.

Z-Folder Kit, 115V, 60Hz voltage input 11-2271-22
Z-Folder Kit, 115V, 50Hz voltage input 11-2271-23

Chart Take-up 11-6402-12

Interchannel Event Marker 11-2123-37
Includes 6 channel harness assembly and one event marker. (Includes pen when ordered with recorder).

Event Marker with mounting hardware. 690565
Maximum of 5 can be added. (Includes pen when ordered with recorder)

Blank Preamplifier Panel 887005

Blank Preamplifier Module 13-4615-09

Drive Amp Extender Card 887526

Pen Pressure Adjustment Wrench 1-120922-18

Penmotor Band 685270

Tube Replacement Tool 267528

TABLE 1-1 2800 SERIES MODEL NUMBERING SYSTEM

2007–XXXX–XX

Operating Voltages

00	115V ± 10%, 60 Hz, divide by 100 chart speeds
04	115V ± 10%, 400 Hz, divide by 100 chart speeds
05	115V ± 10%, 50 Hz, divide by 100 chart speeds
06	230V ± 10%, 50 Hz, divide by 100 chart speeds
10	115V ± 10%, 60 Hz, divide by 60 chart speeds
14	115V ± 10%, 400 Hz, divide by 60 chart speeds
15	115V ± 10%, 50 Hz, divide by 60 chart speeds
16	230V ± 10%, 50 Hz, divide by 60 chart speeds

Type of Mounting and Preamplifier Cage and Frame Configuration

00	Portable case for recorder only
08	Portable case and eight preamp cage
10	Rack mounting kit and shipping frame for recorder only
18	Rack mounting kit, 8 channel preamp frame for 4600 Series preamps and shipping frame
20	Rack mounting kit and vertical cabinet for recorder only
28	Rack mounting kit, 8 channel preamp frame for 4600 Series preamps and vertical cabinet
30	Rack mounting kit, shipping frame, and ac power kit for recorder only
38	Rack mounting kit, 8 channel preamp frame for 4600 Series preamps, shipping frame and ac power kit
40	Rack mounting kit, vertical cabinet and ac power kit for recorder only
48	Rack mounting kit, 8 channel preamp frame for 4600 Series preamp, vertical cabinet and ac power kit
50	Rack mounting kit, shipping frame and 30 microampere isolated power kit for recorder only
58	Rack mounting kit, 8 channel preamp frame for 4600 Series preamp, shipping frame and 30 microampere isolated power kit
60	Rack mounting kit, vertical cabinet and 30 microampere isolated power kit for recorder only
68	Rack mounting kit, 8 channel preamp frame for 4600 Series preamps, vertical cabinet and 30 microampere isolated power kit
70	Rack mounting kit, recorder only
78	Rack mounting kit, 8 channel preamp frame for 4600 Series preamps

Number of Channels

88	Eight 40mm channels, chassis assembly, drive amplifiers and timer

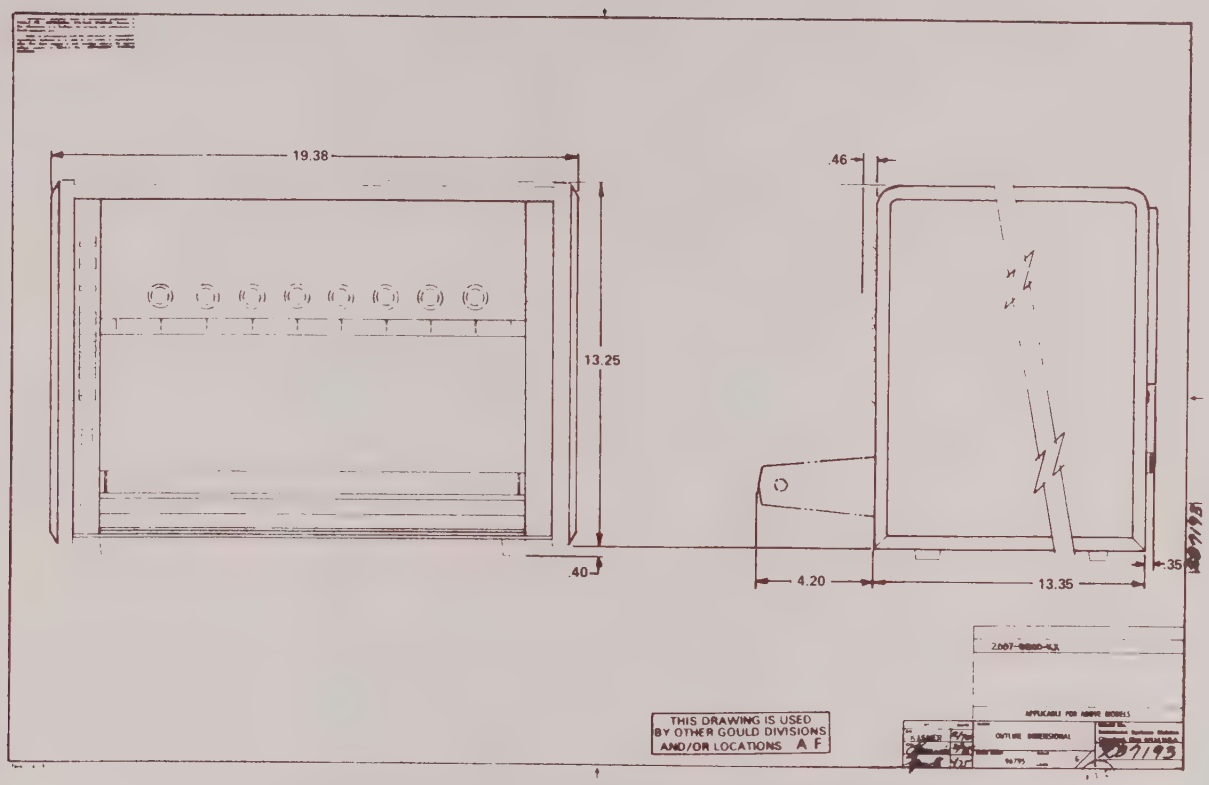


FIGURE 1-2 OUTLINE DIMENSIONS – 2800 SERIES

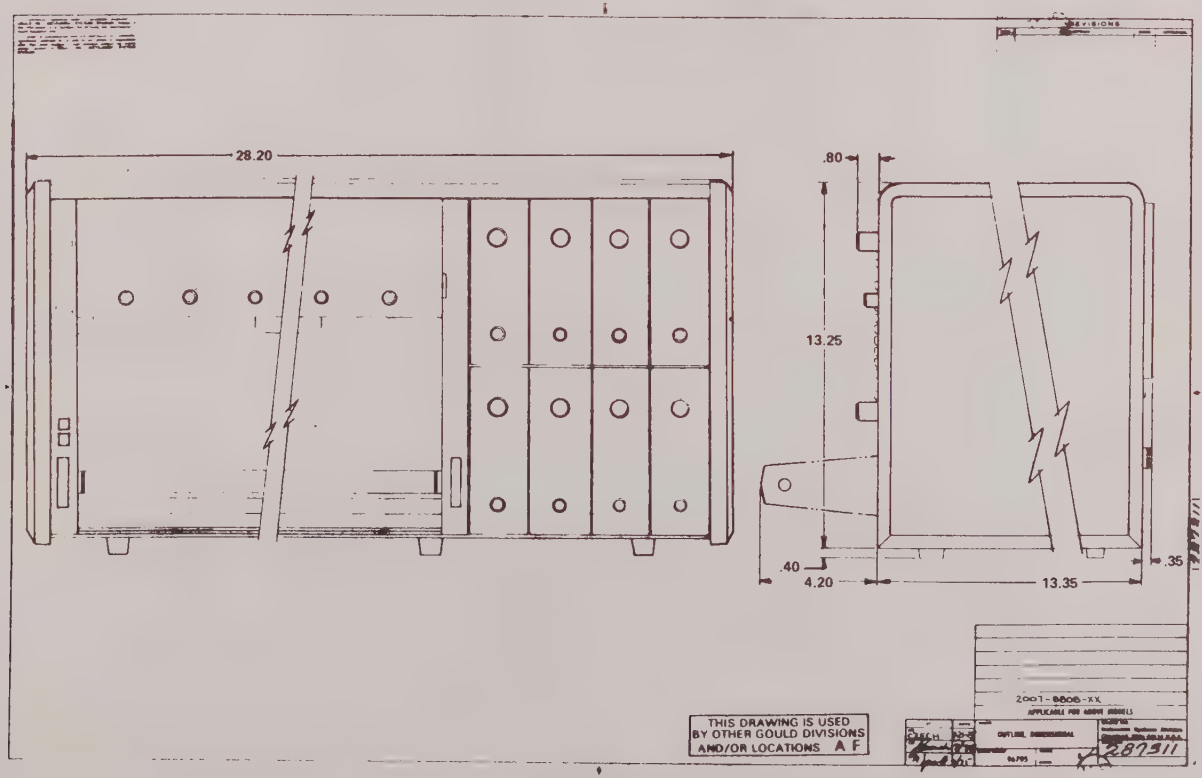
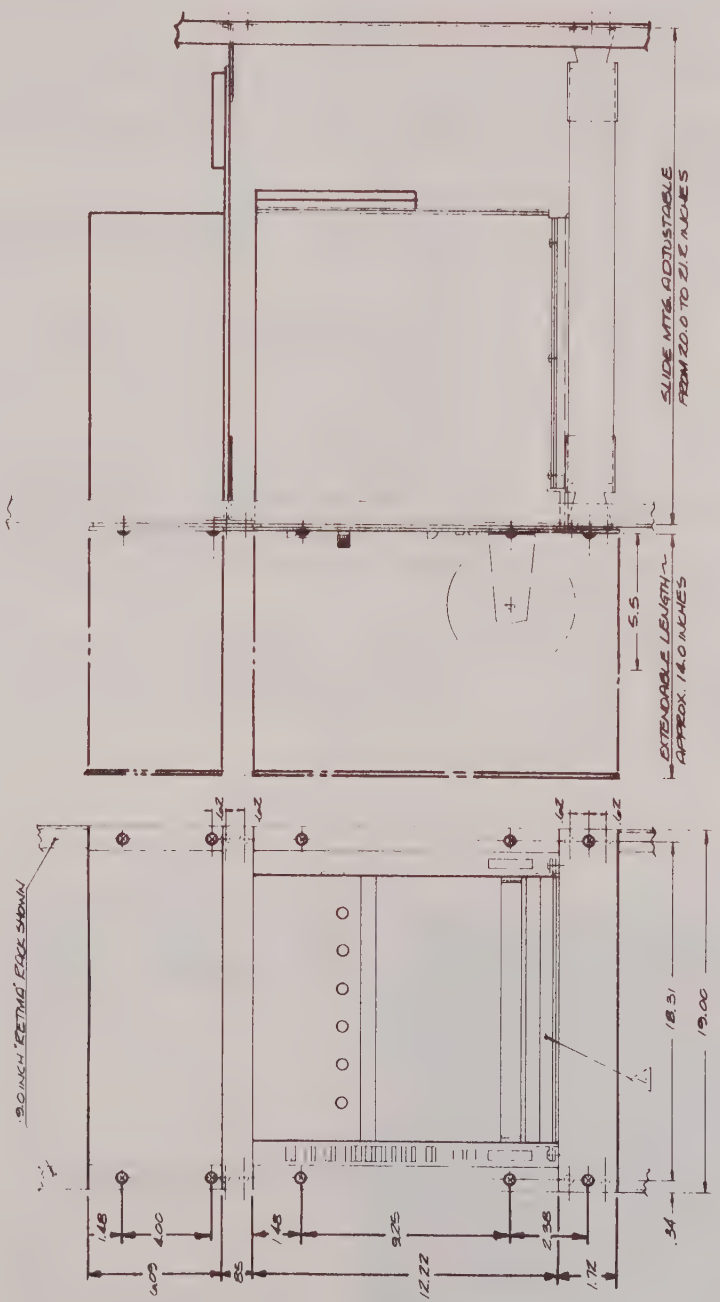


FIGURE 1-3 OUTLINE DIMENSIONS – 2800 SERIES WITH PREAMPS



⚠ FRONT VIEW OF 2007-6676-XX IS SHOWN. DIMENSIONS REMAIN THE SAME FOR ALL OTHER RACK MOUNTED VERSIONS OF 2600 & 2800 RECORDERS.

FIGURE 1-4 .OUTLINE DIMENSIONS – 2800 RACK MOUNT

SECTION II

INSTALLATION

2.1 GENERAL

This section contains information necessary to put the recorder into service, including installation of optional equipment.

2.2 SERVICE UPON RECEIPT

CAUTION: POWER MUST BE OFF DURING THE FOLLOWING SEQUENCE.

Before making signal connections and applying power to the recorder, the following service must be performed:

1. Remove sheet of chart paper from under pens and load roll of chart paper as described in Section VI.

2. **Turn all manual ink valves to ON position. (Follow direction of arrows on manifold bar.) Remove the recorder top front cover to gain access to valves. Slide cover forward and lift out. (If recorder is rack mounted, slide recorder out of rack.)**

3. **Ink cartridges and ink solenoid valves are turned on prior to shipment from factory.**

NOTE: Ink cartridges should be near full.

4. Place cover back in position (on portable units) or slide recorder back into rack and secure.

2.3 LINE VOLTAGE REQUIREMENTS

The last digit of the model number designates line voltage and frequency. Listed below are last digit of model number and line voltage and frequency required.

DIGIT	LINE VOLTAGE & FREQUENCY
0	115 vac @ 60Hz
4	115 vac @ 400 Hz
5	115 vac @ 50 Hz
6	230 vac @ 50 Hz

2.4 ANALOG SIGNAL CONNECTIONS

a. Without Preamplifiers

On recorders not supplied with preamplifiers, signal input connections are made directly to pen drive amplifiers. Two phone jacks are provided on each drive amplifier. These are located on the rear of the recorder (Figure 2-1). Use shielded cable (Belden 8422 or equal). Tip is high, ring is low, barrel is com.

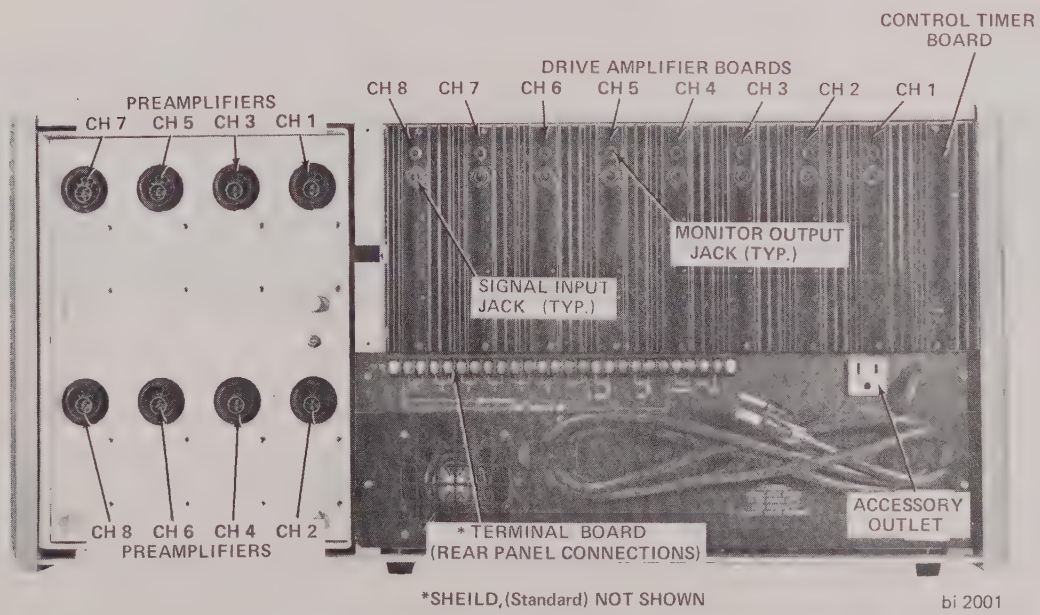

CONTROL TIMER BOARD
DRIVE AMPLIFIER BOARDS
CH 8 CH 7 CH 6 CH 5 CH 4 CH 3 CH 2 CH 1
PREAMPLIFIERS
CH 7 CH 5 CH 3 CH 1
MONITOR OUTPUT JACK (TYP.)
SIGNAL INPUT JACK (TYP.)
ACCESSORY OUTLET
CH 8 CH 6 CH 4 CH 2
PREAMPLIFIERS
* TERMINAL BOARD (REAR PANEL CONNECTIONS)
*SHEILD,(Standard) NOT SHOWN
bi 2001

FIGURE 2-1 SIGNAL INPUT CONNECTIONS

b. With Preamplifiers

On recorders supplied with preamplifiers, signal input connections are made via a connector located in the preampifier cage. Refer to applicable preamplifier manual for their signal input connections.

2.5 EVENT MARKER INPUTS

a. Standard Event Markers

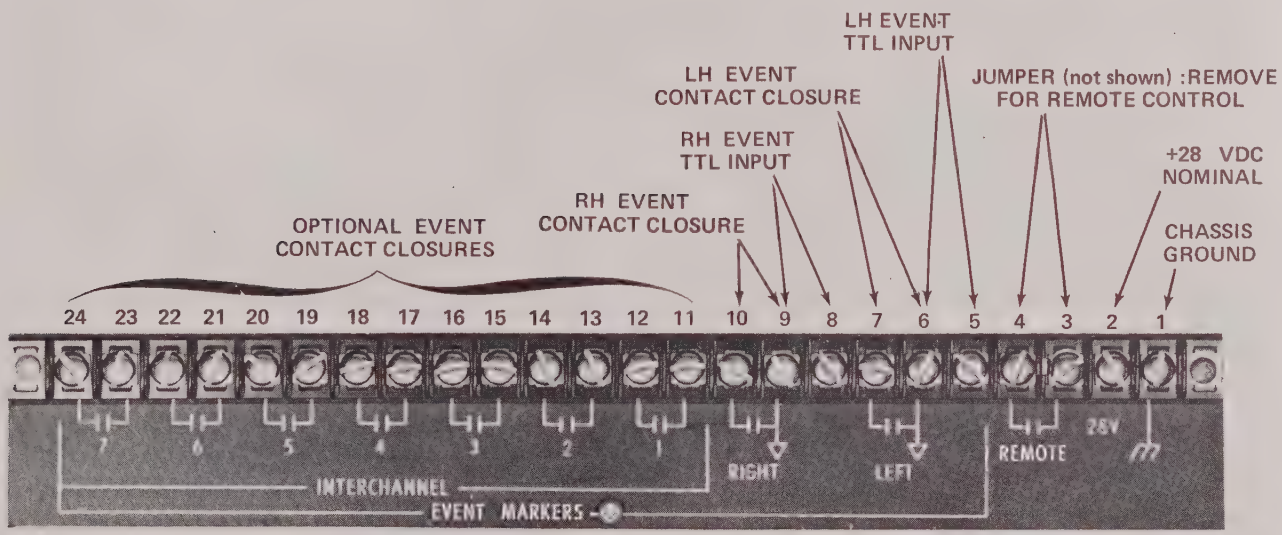
Two event markers are standard. Their locations are between channels 1 and 2, and 7 and 8. Actuation is made by momentary switches on front panel or externally via the terminal strip located on recorder rear panel. External actuation may be made by contact closure or TTL signal input. Refer to Figure 2-2 for connections.

b. Optional Event Markers

Interchannel optional event markers are actuated by a contact closure via the rear panel terminal strip. Refer to Figure 2-2 for connections.

2.6 REMOTE CHART DRIVE (Stop/Start)

For remote chart drive operation, remove jumper between pins 3 and 4 on rear panel terminal strip. A contact closure across these pins will remote enable chart drive motor. Refer to Figure 2-2. Chart SPEED must be preselected.


LH EVENT TTL INPUT
LH EVENT CONTACT CLOSURE
JUMPER (not shown) :REMOVE FOR REMOTE CONTROL
RH EVENT TTL INPUT
+28 VDC NOMINAL
RH EVENT CONTACT CLOSURE
OPTIONAL EVENT CONTACT CLOSURES
CHASSIS GROUND
24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
7 6 5 4 3 2 1
INTERCHANNEL EVENT MARKERS
RIGHT
LEFT
REMOTE
28V

NOTE: "L" SHAPED SHIELD, STANDARD, (not shown) PROTECTS TERMINAL BOARD.

bi 2002

FIGURE 2-2 REAR PANEL TERMINAL CONNECTIONS

2.7 CHART TAKEUP INSTALLATION

Refer to Figure 2-3, and install the optional chart takeup as follows:

1. Disconnect recorder from power source.
2. Remove case from recorder as described in Section V (or slide recorder about 6 inches out of rack).
3. Remove plastic caps covering slots in front panel.
4. Position chart takeup on front panel with drive belt on left side. Secure with screws and lockwashers.
5. Slide pulley onto drive roll shaft, and secure with cotter pin.
6. Position drive belt over pulley.
7. Reinstall case (or slide recorder back into rack and secure).

2.8 RACK MOUNTING KITS

Rack mounting kit for recorder only is Model 11-1202-14. If preamp cage is required (for 4600 series preamps) additional kit Model 11-1202-15 is required. Installation instructions are provided with each kit.

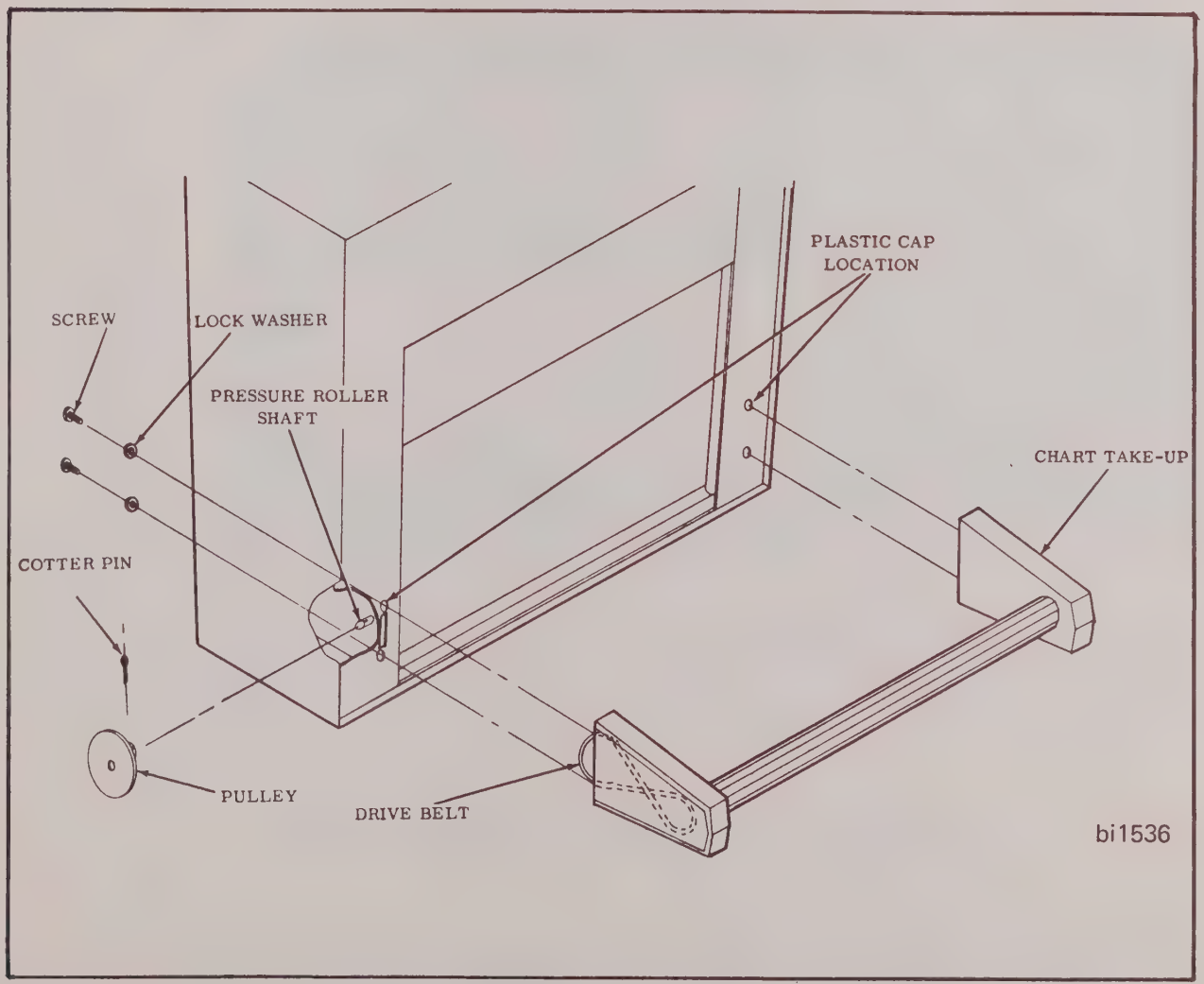


FIGURE 2-3 CHART TAKEUP INSTALLATION

SECTION III

OPERATION

3.1 GENERAL

This section provides complete instructions for operation of the recorder. Functional descriptions of the controls and indicators are provided. If the recorder is equipped with preamplifiers, refer to their applicable instruction manuals for operating instructions.

3.2 FRONT PANEL CONTROLS & INDICATORS

Figure 3-1 illustrates the front panel controls and indicators. The following list corresponds to the items called out on Figure 3-1.

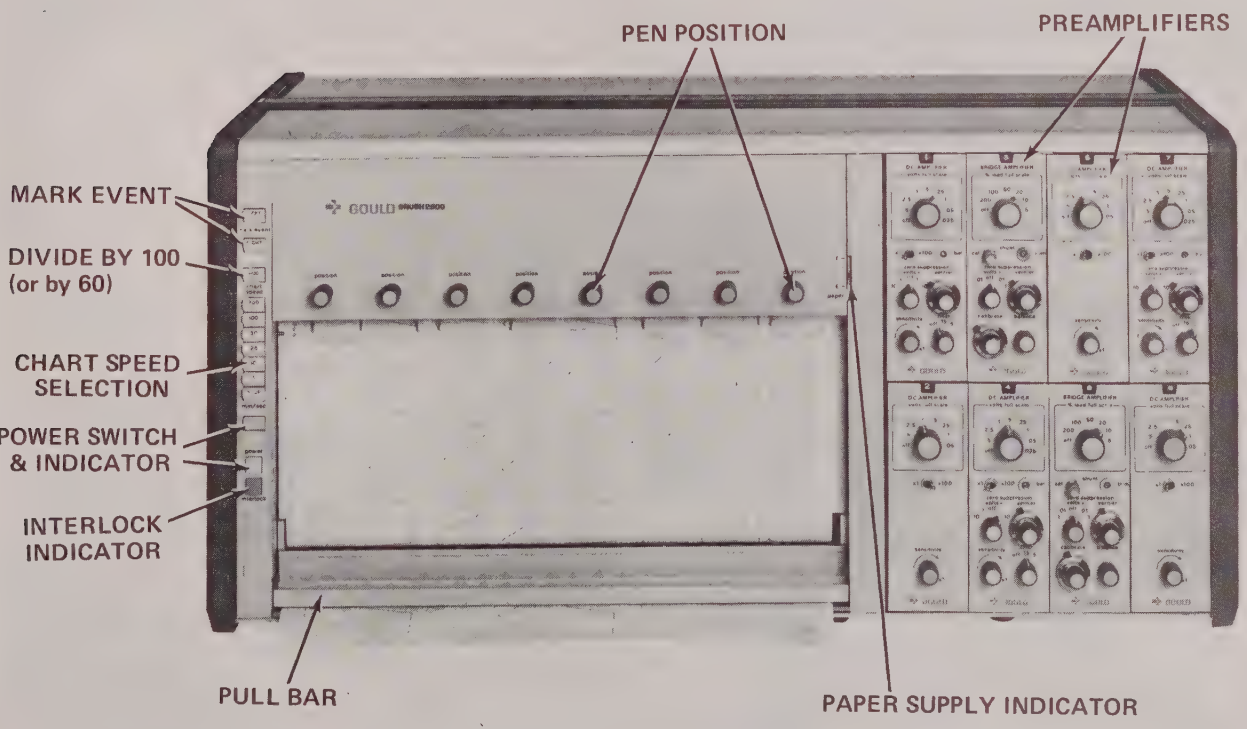


FIGURE 3-1 FRONT PANEL CONTROLS & INDICATORS

CONTROLS	DESCRIPTION
POWER SWITCH	Controls AC to recorder. Depress to turn recorder ON or OFF. POWER lamp illuminates when recorder is ON.
CHART SPEED	Permits selection of six chart speeds and STOP. When in STOP position chart drive is off, and pens will not respond to input signals. Depressing any chart speed button will activate the chart drive at the selected speed. Chart speeds may be changed while chart drive is running.
DIVIDE BY 100 (or by 60)	When depressed, chart speeds become 0.05, 0.10, 0.25, 0.50, 1.0, and 2.0 mm/second (divide by 60 becomes 5, 10, 25, 50, 100, and 200 mm/minute.
MARK EVENT	Two momentary switches permit manual marking of an event. When left MARK EVENT button is depressed the left event marker pen will deflect to the left. When the right MARK EVENT button is depressed the right event marker pen will deflect to the left. **NOTE: The EVENT MARKER pens will remain deflected until the mark event button is released.**
PEN POSITION	Permits pen positioning anywhere within the channel.
PULL BAR	Pull to gain access to chart paper supply roll.
INTERLOCK INDICATOR	Lamp illuminates when writing table is not completely closed or paper supply is exhausted.
POWER INDICATOR	Lamp illuminates when POWER switch is depressed.
PAPER SUPPLY INDICATOR	Gauge to indicate quantity of chart paper remaining.
PREAMPLIFIERS	Refer to applicable Preamplifier manuals for operating instructions.

3.3 REAR PANEL

Figure 3-2 illustrates the recorder rear panel. The following list corresponds to the figure.

CONTROLS	DESCRIPTION
PREAMP CAGE	Houses preamplifiers if part of recorder system.
SIGNAL INPUT	Jacks for signal input direct to drive amplifiers.

CONTROLS	DESCRIPTION
TERMINAL STRIP	Refer to Section II for connections.
TIMER	ON/OFF toggle switch for timed left hand event marker activation.
ACCESSORY OUTLET	Provides ac power for other equipment.
MONITOR JACK	Monitors output of preamplifier (regardless of chart display). For use on Scope, Meter, Output panel, etc.

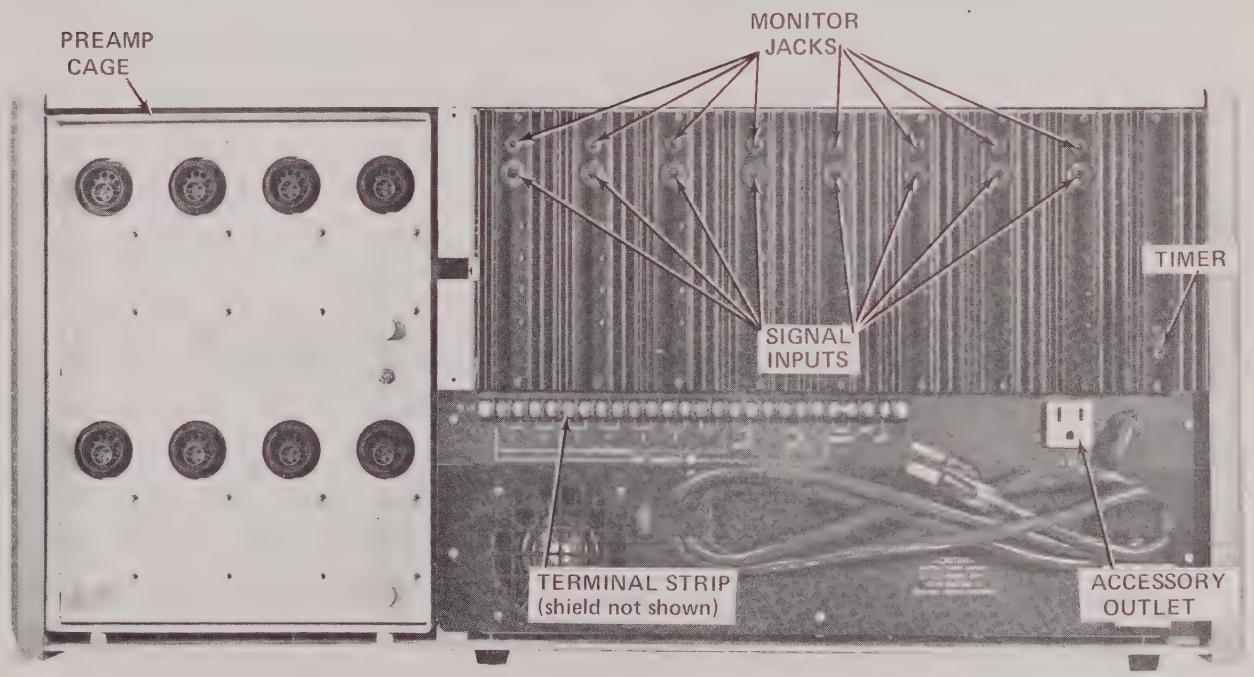


FIGURE 3-2 REAR PANEL

3.4 TIMER SETTING

The timer actuates left event markers at programmed repetition rates. Selection of repetition rates is made via switch S-104 on the control board. Set rate as follows:

1. Turn recorder power OFF.
2. Loosen the two screws which secure the control board and pull out of the recorder.
3. Set switch positions for desired repetition rate per Table 3-1.

NOTE: Use switch positions for line frequency recorder operates on.

4. Replace control board and secure with screws.
5. Turn recorder power ON.
6. Turn TIMER switch ON. Timer ready for operation.

3.5 SETUP AND OPERATION

Prepare recorder for operation as follows:

CAUTION: MAKE SURE ALL PROCEDURES DESCRIBED IN SECTION II, INSTALLATION HAVE BEEN PERFORMED.

1. Check paper supply level. Make sure an adequate supply present for length of time recorder is to be operated and it is properly threaded.
2. Make sure chart STOP pushbutton is depressed.
3. Depress POWER pushbutton. POWER lamp should illuminate.
4. Depress 5mm/sec chart speed pushbutton, and allow chart to travel about one foot. If no pen trace is present, refer to Section VI.
5. Set pen to show full scale deflection within channel limits.
6. Apply input signal to recorder.
7. Set chart SPEED to that which will best display signal.

TABLE 3-1. SWITCH SETTINGS VS TIMER REPETITION RATE FOR VARIOUS POWER LINE FREQUENCIES

REPETITION RATE	60 HZ LINE		50 HZ LINE		400 HZ LINE	
	SW ON	SW OFF	SW ON	SW OFF	SW ON	SW OFF
0.1 SECOND	2,3,5	1,4,6,7,8	1,3,5	2,4,6,7,8	3,6	1,2,4,5,7,8
1.0 SECOND	2,3,6	1,4,5,7,8	1,3,6	2,4,5,7,8	3,7	1,2,4,5,6,8
10.0 SECONDS	2,3,7	1,4,5,6,8	1,3,7	2,4,5,6,8	3,8	1,2,4,5,6,7
100.0 SECONDS	2,3,8	1,4,5,6,7	1,3,8	2,4,5,6,7	——	——
0.01 MINUTE	2,4,6	1,3,5,7,8	1,4,6	2,3,5,7,8	4,7	1,2,3,5,6,8
0.10 MINUTE	2,4,7	1,3,5,6,8	1,4,7	2,3,5,6,8	4,8	1,2,3,5,6,7
1.00 MINUTE	2,4,8	1,3,5,6,7	1,4,8	2,3,5,6,7	——	——

SECTION IV

THEORY OF OPERATION

4.1 GENERAL

The 2800 Series Recorder is a modular-constructed unit consisting of a 380mm (total chart width) mainframe and 8 analog recording channels. Each analog recording channel is electrically identical. Figure 4-1 illustrates a block diagram of the basic recorder.

Preamplifiers are optional and are discussed in their respective instruction manuals.

4.2 MAINFRAME

The mainframe contains a switchboard, control board, control transformer, chart drive motor and transmission and event markers.

a. Switchboard

The switchboard is mounted on the left side of the front panel. It contains the operator controls: switches for POWER ON/OFF, CHART SPEED selection, and EVENT Marker actuation; and indicators for POWER ON and INTERLOCK.

The POWER switch is a set-reset pushbutton which interrupts both phase and neutral sides of the ac power line.

Chart speed selection is made by depressing one of six SPEED, a DIVIDE, or STOP pushbutton. The SPEED and STOP pushbuttons are mechanically interlocked to reset a previously selected pushbutton. The DIVIDE is a set/reset pushbutton. A combination of three transmission solenoids are activated by the SPEED pushbuttons to obtain the desired chart speed. Table 4-1 defines chart speed versus solenoid activation. Each chart speed may be divided by 60 or 100 (depending upon model number) by depressing the DIVIDE pushbutton. This activates solenoid L101. The STOP pushbutton interrupts power to the motor/transmission via relay K-101 and resets the SPEED pushbuttons.

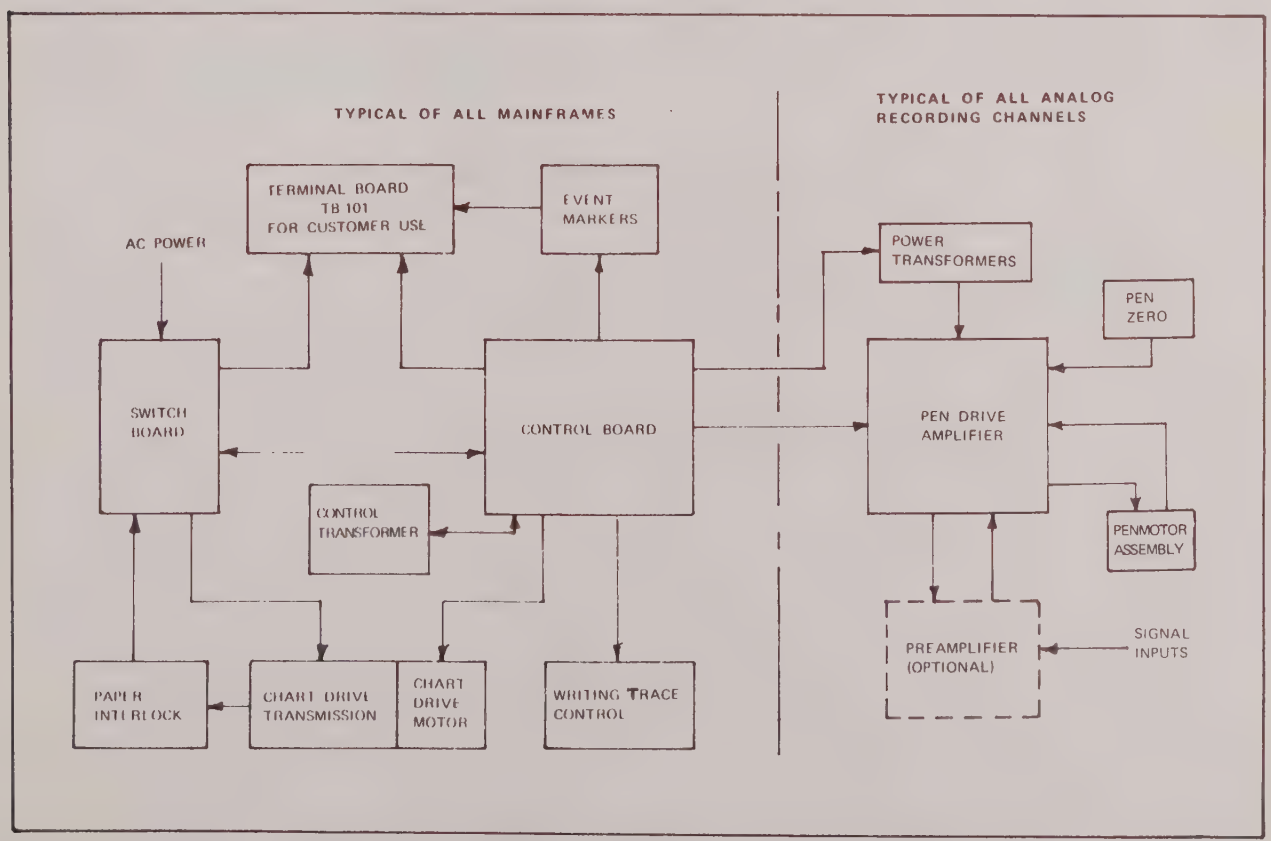


FIGURE 4-1 BASIC RECORDER BLOCK DIAGRAM

When the LEFT or RIGHT MARK EVENT push-buttons are depressed, solenoids L108 and L109 respectively are energized activating the left or right event markers. These are momentary push-buttons, and reset when released.

TABLE 4-1.
CHART SPEEDS VS SOLENOID ACTIVATION

CHART SPEED (MM/SEC)	SOLENOID ACTIVATED L-102	L-103	L-104
5.0	X	X	
10	X		X
25		X	X
50		X	
100			X
200			

NOTE: Divide by 100 (or 60) activates L-101.

b. Control Board

The control board is mounted in the card cage in the rear of the recorder. Contained in the control board are the branch fuses, start/stop relay K-101, the +5Vdc and +28Vdc power supplies, and timer.

Fuses are provided to protect each power branch. Table 4-2 shows fuse and circuit protected.

DPDT relay K101 controls power to the chart drive motor, ink solenoids, standard event markers, and optical couplers located in the pen drive amplifiers. It is energized when the chart STOP push-button is released. When energized, one set of contacts supplies power to the chart drive motor thru fuse F112 and activates the ink manifold solenoids. When de-energized, the other set of contacts inhibit the event markers and optical couplers in the pen drive amplifiers.

The control board contains two dc power supplies: +28V and +5V. The +28Vdc power source is obtained from bridge rectifier CR102 and control transformer T109. The unfiltered section of this section of the supply provides power to relay K101, optional event marker solenoids, and the indicator lamps. The filtered section of this supply provides power to the standard event markers to insure accuracy when precise time events are required. The +5Vdc power source is obtained thru CR102 from a second winding on control transformer T109. This supply is filtered and regulated to provide power for the pen drive amplifier optical couplers and timer.

Pulsating dc voltage is provided from bridge rectifier CR101 to operate the ink supply solenoids.

TABLE 4-2 FUSE VS CIRCUIT PROTECTED

FUSE	CIRCUIT PROTECTED
F101 To F108	Analog channel power transformers T101 to T108.
F109	Control transformer T109 which supplies power for the +5V and +28V dc power supplies.
F110	Fan motor B102.
F111	Ink solenoids
F112	Chart Drive Motor
F113	115Vac convenience outlet.

The timer operates as a function of ac line frequency. Optical coupler U107 shapes the sinusoidal wave into a square wave. Binary counters U102 through U105 count the square wave pulses. Switch S104 selects combinations of U102 through U105 for the output pulse repetition rate (time interval) desired. The output pulse drives monostable multivibrator U106. Output from U106 turns on Q102 or Q103, activating the left event markers. (See Table 3-1).

c. Event Markers

Left and right standard event markers are activated by the MARK EVENT switches, optional timer, or remote application of TTL signals or contact closure. Depressing a MARK EVENT switch permits current to flow from CR106 through the mark event solenoid, activating the event marker.

NOTE: TTL and switch closure are described for left event marker only. Right event marker is identical.

Placing a switch closure (short) across terminals 6 and 7 of TB101, permits current to flow from CR-106 through the mark event solenoid, activating the event marker. Application of a TTL signal across terminals 5 and 6 of TB101, causes Q101 to conduct, activating the event marker.

4.3 ANALOG RECORDING CHANNELS

a. General

Each analog recording channel consists of a power transformer, pen drive amplifier, and penmotor. The channels are isolated from one another by using separate transformer power supplies and optical couplers. The optical coupler disables the pen drive amplifier whenever relay K101 on the control board is de-energized from depressing chart STOP pushbutton or upon loss of ac power.

Each power transformer has two primary and three secondary windings. The primary windings can be wired in parallel for 115vac operation of in series for 230 vac operation. Two of the secondary windings (±35 and ±15 volts) provide power for the pen drive amplifier. The third (13Vac– may be used in preamplifiers requiring isolated power supplies for bridge excitation or suppression.

Figure 4-2 shows a block diagram of an analog channel. The penmotor drive amplifier is a complete servo system and uses a linear voltage displacement transformer (Metrisite*) in the penmotor to develop position, and a velocity transducer for velocity. These signals are summed with the input signal in a dc error amplifier which, after amplification, drives the penmotor.

b. Signal Limiter

The input signal enters the signal limiter and is summed with the pen zero signal. The summed signal is fed to a diode bridge circuit. Output from the bridge is limited to ±2.6 volts.

c. Frequency Compensation Network

Output from the signal limiter is fed to a frequency compensation network. Here, the signal's frequency response is adjusted to be flat within 2% from dc to 60 Hz pen deflection and from dc to 125 Hz for 10 division pen deflection. The frequency compensated signal is then fed to summing network where it is combined with error and velocity signals.

d. Oscillator and Demodulator

Position feedback is obtained from the Metrisite. Excitation for the Metrisite is obtained from a 20 KHz Wein Bridge Oscillator. A demodulator attenuates the 20KHz carrier. Output from the demodulator is the position feedback signal.

e. Servo Control Amplifier

The compensated input signal, position feedback, and velocity are summed at the input of the servo amplifier. The output of this stage drives a Class B amplifier, which drives the pen to the proper position on the chart. This occurs when the summed signal is reduced to zero.

*Registered Trademark of Gould Inc.

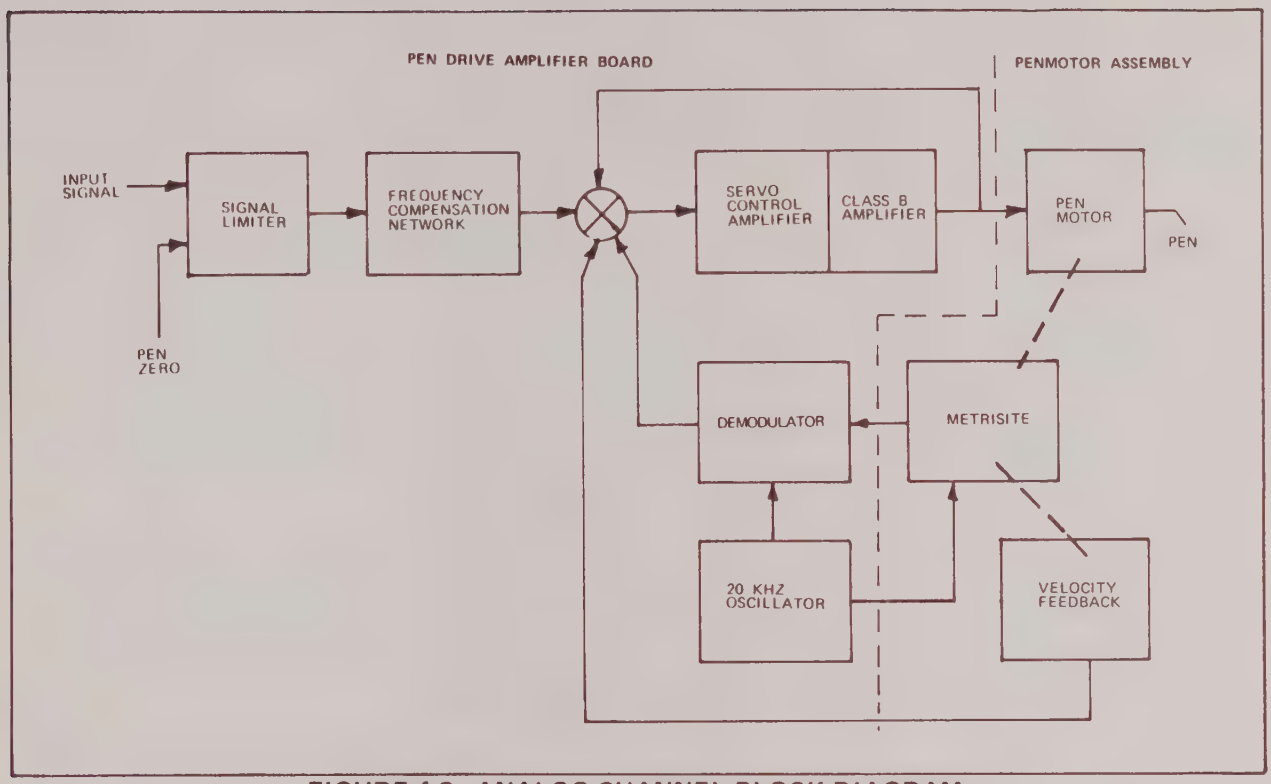


FIGURE 4-2 ANALOG CHANNEL BLOCK DIAGRAM

SECTION V

TROUBLESHOOTING

5.1 GENERAL

This section provides troubleshooting hints to assist the operator and/or serviceman in locating malfunctions that are the possible causes and remedy. If a problem exists which is not identified in this section, contact the factory for assistance.

5.2 ELECTRICAL POWER MALFUNCTIONS

MALFUNCTION	CAUSE	REMEDY
1. Recorder inoperative (Power ON and INTERLOCK Lamps are extinguished with POWER ON switch depressed.	a. Recorder not connected to power source.	a. Connect to power source.
	b. Fuse F109 blown.	b. Replace fuse.
	c. POWER ON switch defective.	c. Replace switch.
2. Recorder Inoperative (POWER ON and INTERLOCK Lamps are illuminated.	a. Chart Paper torn or supply is depleted.	a. Rethread or replace chart paper.
	b. INTERLOCK switch defective.	b. Replace switch.

5.3 CHART DRIVE MALFUNCTIONS

MALFUNCTION	CAUSE	REMEDY
1. Inoperative	a. Desired Chart SPEED button not depressed.	a. Depress desired chart speed button.
	b. Drive belt worn or broken.	b. Replace drive belt.
	c. Jumper between pins 3 & 4 of TB101 missing.	c. Replace Jumper
	d. Fuses F111 or F112 blown.	d. Replace Fuse.
	e. Motor defective.	e. Replace motor.
	f. Chart speed switch defective.	f. Replace switch board assy.
	g. Relay K101 defective.	g. Replace relay.
2. Operative on only some speeds.	a. Chart speed switches defective.	a. Replace switch board assy.
	b. Transmission defective	b. Replace transmission.
	c. Broken wire on transmission terminal.	c. Repair connection.

5.3 CHART DRIVE MALFUNCTIONS (Continued)

MALFUNCTION	CAUSE	REMEDY
3. Inoperative on divide by 100 speed.	a. Transmission defective	a. Replace transmission.
	b. Switch defective.	b. Replace switch.
	c. Broken wire to transmission.	c. Replace wire.
4. Chart speed not accurate or is erratic.	a. Drive roll worn excessively.	a. Clean or replace drive roll.
	b. Transmission defective	b. Replace transmission.

5.4 WRITING SYSTEM MALFUNCTIONS

MALFUNCTION	CAUSE	REMEDY
1. Trace missing or faint.	a. Ink supply exhausted.	a. Replace ink cartridge.
	b. Screw on ink cartridge not fully counterclockwise.	b. Turn screw fully counterclockwise.
	c. Ink manifold valves not in full ON position.	c. Rotate to full ON position.
	d. Pens clogged.	d. Clean or replace pens.
	e. Ink manifold solenoid defective.	e. Replace valve & solenoid assembly.
	f. Ink manifold solenoid de-energized.	f. Fuse F112 blown: replace fuse.
	g. Air in System	g. Bleed System.
2. Trace heavy or wet; pen gouges paper.	a. Pen excessively worn.	a. Replace pen.
	b. Pen not properly lapped	b. Lap pen.
	c. Improper pen pressure.	c. Adjust pen pressure.
3. All pens not on same time line.	a. Pen(s) out of alignment.	a. Align Pen(s).
4. Pen fails to return to same position each time.	a. Loose pen.	a. Align and tighten pen.
	b. Loose penmotor linkage.	b. Replace penmotor.

5.5 SIGNAL MALFUNCTIONS

MALFUNCTION	CAUSE	REMEDY
1. Trace unusually wide.	a. Noise appearing at the pen tip.	a. Check input signal and connections. Defective drive amplifier or preamplifier boards; repair or replace.
2. No signal on any or all channels.	a. Drive amplifier or preamplifier defective.	a. Replace drive amplifier or preamplifier.
	b. Drive amp fuse(s) blown.	b. Replace fuse(s) after correcting malfunction.
	c. Chart speed stop switch defective.	c. Replace switch.
3. Pens limp or biased to either side.	a. Drive amplifier or preamplifier defective.	a. Repair or replace drive amplifier or preamplifier.
	b. Recorder requires calibration.	b. Calibrate recorder.
	c. Pen loose.	c. Align and tighten pen.
	d. Defective pen position pot.	d. Replace pen position pot.

SECTION VI

MAINTENANCE

6.1 GENERAL

This section contains information for use in preventive and corrective maintenance of the 2800 Series Recorder. Refer to Section V, Troubleshooting for guidelines in localizing problem areas.

6.2 CLEANING

a. General Cleaning

CAUTION: AVOID USE OF CHEMICAL CLEANING AGENTS WHICH MIGHT DAMAGE PLASTIC OR PAINTED SURFACES. DO NOT USE CHEMICALS WHICH CONTAIN TOLUENE, ACETONE, OR SIMILAR SOLVENTS.

EXTERIOR: Remove loose dust with a soft cloth or small paint brush. Dirt which remains can be removed with a soft cloth dampened in a mild detergent and water solution. Do not use abrasive cleaners.

INTERIOR: Dust in recorder interior should be removed occasionally due to its electrical conductivity under high-humidity conditions. Blow off accumulated dust with dry, low-pressure air. Remove any dirt which remains with a soft paint brush or a soft cloth dampened in a mild detergent and water solution. A cotton-tipped applicator is useful for cleaning in narrow spaces and/or printed circuit boards.

b. Ink Removal

NOTE: The recommended ink remover is ANCHOR HAND CREAM, No. 25 obtainable from Anchor Office Supply Co. of Cleveland, Ohio.

1. Blot up any excess ink with a tissue or paper towel.
2. Apply ink remover to the inked area ONLY. DO NOT attempt a general cleaning.
3. Gently rub the area with a soft cloth until the ink spot is removed.
4. Wipe the area thoroughly with a damp cloth.
5. Allow cleaned are to dry at least ten minutes before using recorder.

6.3 CHART PAPER REPLACEMENT

1. Depress chart STOP pushbutton and release power pushbutton.
2. Grasp pull bar (Figure 6-1) and open writing table.

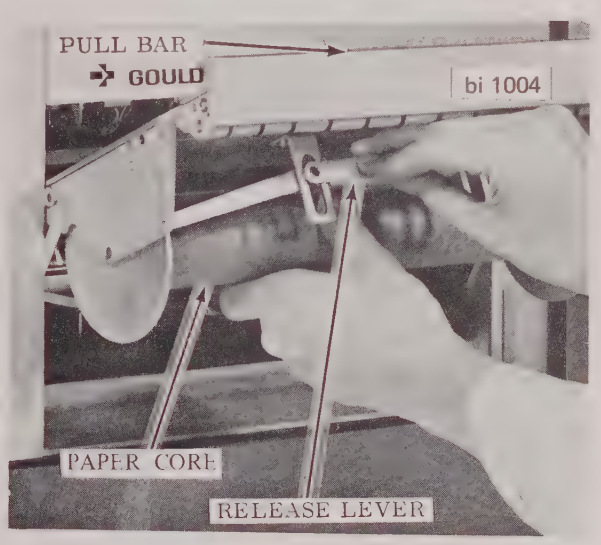


FIGURE 6-1 PAPER ROLL REMOVAL

3. Hold paper supply roll and pull down on paper supply release lever. Remove paper supply roll.
4. Unscrew right flange from paper supply roll. Remove and discard core (Figure 6-2).
5. Slide new paper roll onto supply shaft. Make sure notches in paper core align with guide pins on left flange and paper edge is facing forward and down.
6. Screw right flange onto supply shaft until it is snug against paper edge.
7. Insert paper roll into writing table assembly. Push release lever up to lock into position.

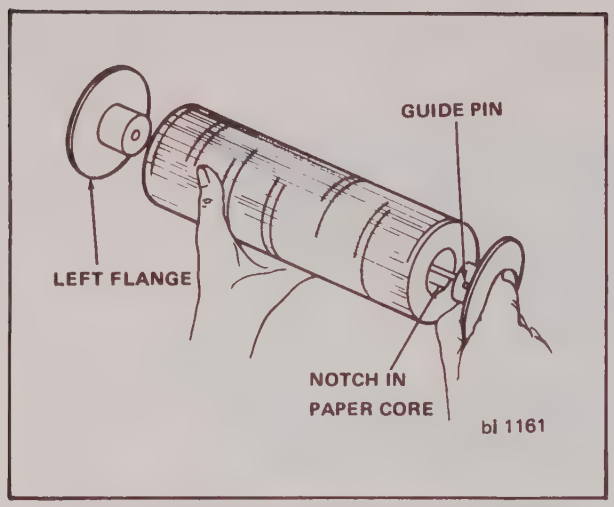


FIGURE 6-2 CHANGING CHART PAPER

CAUTION: MAKE SURE SHAFT IS SEATED PROPERLY AND ROTATES FREELY. USE CARE WHEN THREADING PAPER SO NOT TO DAMAGE PENS.

8. Refer to Figure 6-3. Feed paper over writing bar, down through slot between pull bar and drive roll, around pressure roll, and out to front of writing table assembly.

9. Slowly close writing table while gently pulling on chart paper. When friction resists rotation of paper roll, pull paper taut and center, and close writing table assembly. Make sure table is completely closed.

10. Turn recorder on and run out about two feet of chart paper at 100 mm/sec to align on writing table.

*6.4 INK CARTRIDGE REPLACEMENT

Ink supply should be sufficient for one year under normal conditions. Cartridge(s) are located on top of recorder. See Figure 6-4. Follow procedure below to replace.

WARNING: MAKE SURE POWER IS OFF AND RECORDER IS DISCONNECTED FROM POWER SOURCE.

1. Remove recorder from case per paragraph 6.9. (If recorder is rack mounted, slide recorder a little more than halfway out of rack).

2. Turn ink supply off by turning activating screw clockwise until compression spring in ink plunger assembly is drawn up tight.

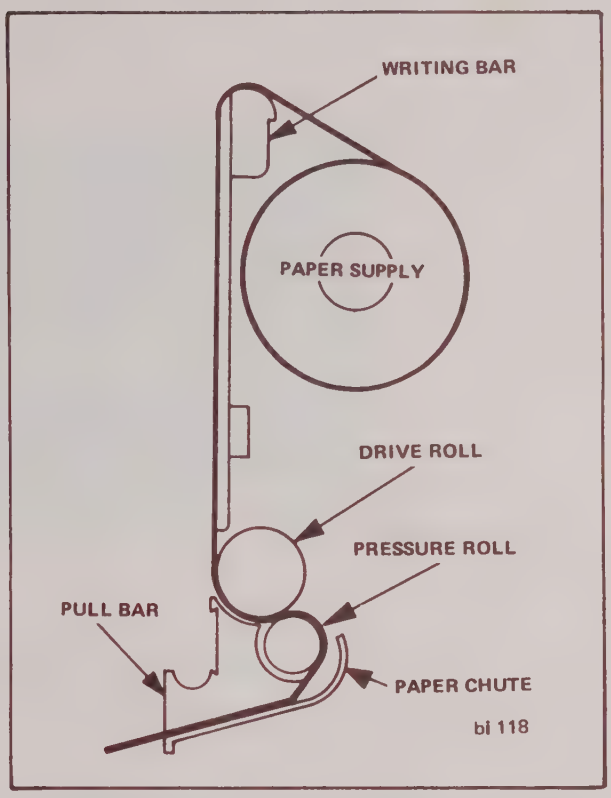


FIGURE 6-3 PAPER THREADING DIAGRAM

CAUTION: DO NOT PERMIT INK TO SPILL ON RECORDER COMPONENTS. PLACE PAPER TOWELS UNDER INK SYSTEM.

3. Carefully pull ink tubing off of ink cartridge.

CAUTION: DO NOT USE TOOLS WHICH MAY GOUGE OR CUT THE INK TUBING.

4. Unscrew ink cartridge from plunger assembly and discard. Refer to Figure 6-5.

5. Remove piston retainer from replacement cartridge and discard.

6. Install cartridge in plunger assembly and tighten firmly.

7. Remove shipping cap from ink cartridge and discard.

8. Install ink tube on ink cartridge.

9. Turn activating screw counterclockwise until snug to pressurize ink system. Check for leaks.

10. Install recorder in case or slide recorder back into rack and secure.

*Refer to paragraph 6.16 as part of replacement procedure.

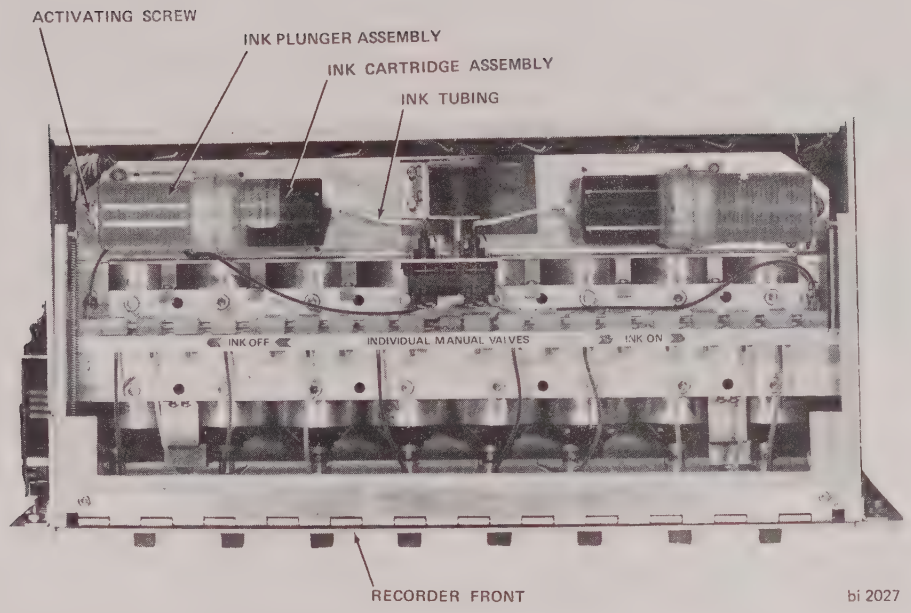


FIGURE 6-4 INK CARTRIDGE REPLACEMENT

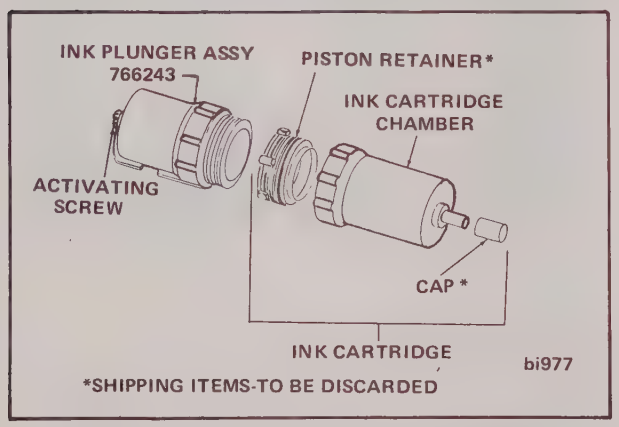


FIGURE 6-5 INK CARTRIDGE ASSEMBLY

6.5 PEN PRESSURE MEASUREMENT

Analog or event marker pen pressure should be checked if the ink trace is excessively wide (bleeding), indicating low pen pressure or if pen gouges the chart paper, indicating excessive pen pressure.

NOTE: Wide trace may also indicate an improperly lapped pen. Refer to Paragraph 6.6 for pen lapping procedures.

The gram gage (part number 240601-910) is used to measure the pressure of the analog and event marker pens as follows:

1. Raise pen access cover by pulling out on bottom and sliding back into recorder.
2. Turn ON recorder and set chart SPEED at 5 mm/sec.
3. Place gram gage hook under pen as close as possible to top. Form a right angle to pen shaft with hook (Figure 6-6).

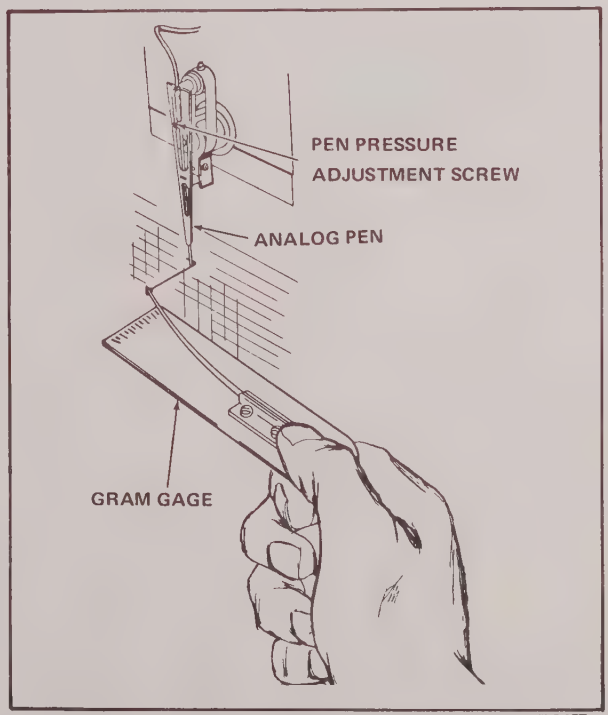


FIGURE 6-6 PEN PRESSURE MEASUREMENT

4. Pull pen from chart as shown in Figure 6-6, and take reading on gage the moment excessive ink starts to flow from pen.

5. Proper pressure for analog pens is 30 ±2 grams, for event marker pen 25 ±2 grams.

6. If pen pressure is not within specified limits, adjust pressure using special pen adjustment wrench (Gould part number 1-120922-18). Refer to Figure 6-7. Turn screw clockwise to increase pressure, counterclockwise to decrease pressure.

7. Recheck pen pressure per steps 3, 4 and 5.

NOTE: When pens are replaced pen pressures must be checked and if required adjusted per above.

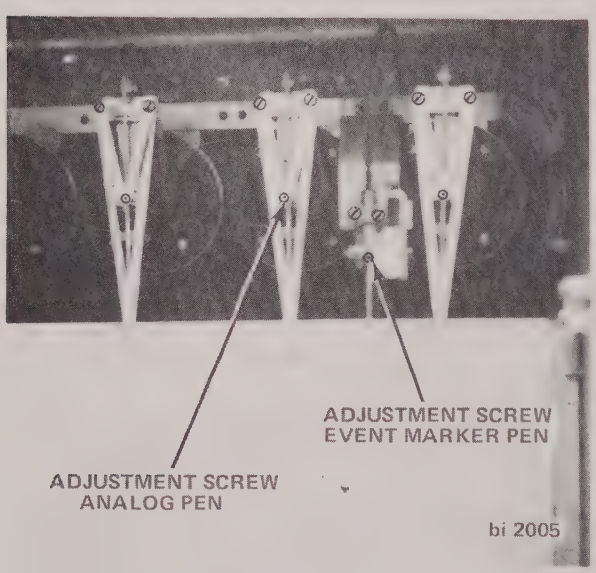


FIGURE 6-7 PEN PRESSURE ADJUSTMENT

6.6 PEN LAPPING

a. General

This paragraph describes and illustrates the proper procedures for lapping the analog and event pens. Intermittent or "wet" ink trace are indications that pen pressure is incorrect or that pen requires lapping. Check for "wet" writing by operating the recorder (no signal applied). Check pen trace by wiping index finger, with moderate pressure, across trace approximately one inch below pen tip. If ink does not smear, pen is properly lapped. If trace smears, check and adjust pen pressure (Para. 6.5). Repeat test, and if trace continues to smear, lapping is required.

b. Lapping Procedures

CAUTION: LAPPING SHOULD ONLY BE DONE WHEN ABSOLUTELY NECESSARY. EXCESSIVE LAPPING WILL SHORTEN PEN LIFE.

1. Turn OFF recorder.

2. Raise pen access cover by pulling out on bottom and sliding it back into recorder.

3. Carefully raise pen tip just enough to slide a small strip of emery paper (600A, Gould part number 669234) under pen tip.

4. Refer to Figure 6-8. Hold emery paper flat against writing table and move it in a circular motion several times while gently pressing pen tip with finger.

5. Remove emery paper and clean debris from pen tip. Operate recorder at 5 mm/sec chart SPEED.

6. Check pen trace by wiping index finger, with moderate pressure, across trace about one inch below pen tip. If ink does not smear, pen is properly lapped. If ink smears, check pen pressure per paragraph 6.5.

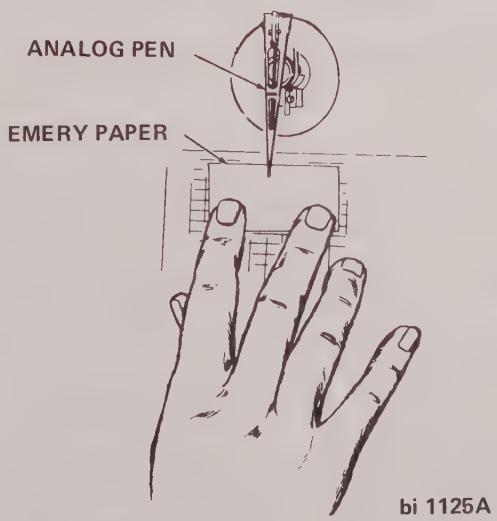


FIGURE 6-8 PEN LAPPING

7. Repeat lapping procedure if necessary.

8. If pen tip should become blocked during lapping operation, touch pen at top of pen (above tip) with a hot soldering iron for a few seconds with the pen tip raised slightly off the paper. This will usually start ink flowing and flush out abrasive.

9. When dry trace is achieved, turn recorder off.

6.7 PEN REPLACEMENT

Pens should only be replaced when excessively worn or broken. Replacement should be performed only by personnel who are familiar with the recorder. Replace and adjust one pen at a time.

a. Analog Pen

NOTE: Analog Pen part number is Model 11-2823-35. Ink tubing is included with pen.

1. Press chart speed STOP button and release POWER button.

2. Raise pen access cover by pulling out on bottom and sliding back into recorder.

3. Turn both pen valves OFF with a flat-blade screwdriver. Remove the top front cover to gain access to valves.

4. Carefully remove ink tube from manifold and pen. Discard ink tube. Wipe excess ink from manifold fitting.

CAUTION: DO NOT PERMIT INK TO SPILL ON RECORDER COMPONENTS. PLACE PAPER TOWELS AROUND AREA.

5. Loosen two screws (do not remove) which secure pen to drive arm and carefully slide pen off in downward motion. (Figure 6-9).

NOTE: If pen does not readily slide off, it may be necessary to loosen pen pressure adjustment screw also.

6. Carefully slide new pen onto drive arm. Snug the two screws to secure pen. (Pen should be perpendicular to writing surface.)

7. Install new ink tubing between manifold and pen.

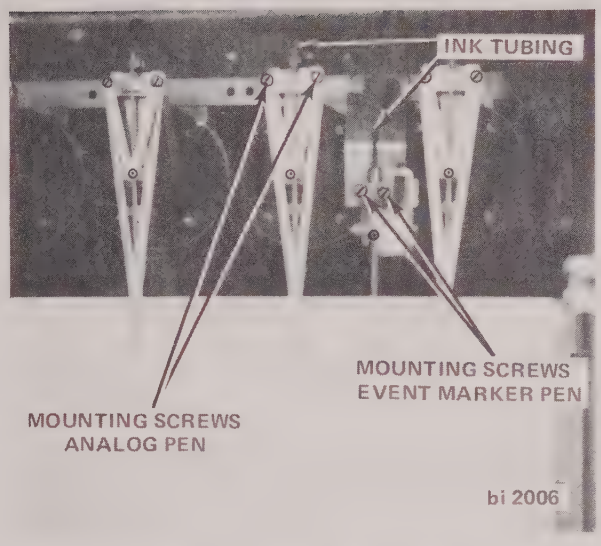


FIGURE 6-9 PEN REPLACEMENT

8. Turn ON ink valves.

9. Turn recorder ON and run at a chart speed of 5 mm/sec.

10. Carefully lift pen slightly and allow ink to bleed through pen tip.

11. Shut down recorder.

12. Gently grasp pen near hub and move pen across entire channel. If trace is not parallel to a horizontal line and/or pen is not on same line as other pens, turn pen in screw slots and slide pen vertically. Tighten screws.

13. Lap and set pen pressure per pagraphs 6.5 and 6.6 if necessary.

b. Event Marker Pen

NOTE: Event Marker Pen number is Model 11-2873-20. Ink tubing is included with pen.

1. Press chart speed STOP button and release POWER button.

2. Raise pen access cover by pulling out on bottom and sliding back into recorder.

3. Turn both pen valves OFF with a flat-blade screwdriver. Remove the top front cover to gain access to valves.

4. Carefully remove ink tube from pen and manifold. Discard ink tube. Wipe excess ink from manifold fitting.

5. Loosen adjustment screw and two screws which secure pen to arm, and carefully slide pen off in downward motion. (Figure 6-9).

NOTE: If pen does not readily slide off, it may be necessary to loosen pen pressure adjustment screw.

6. Carefully slide new pen onto arm. Snug screws to secure pen. (Pen should be perpendicular to writing surface.)

7. Install new ink tubing between manifold and pen.

8. Turn ON ink valves.

9. Turn recorder ON and run at a chart speed of 5 mm/sec. Adjust pen ZERO to set pen on event gridline.

10. Carefully lift pen slightly and allow ink to bleed through pen tip.

11. Shut down recorder.

12. If pen tip is not on same line as other pens, loosen screws and slide pen vertically. Tighten screws.

13. Lap and set pen pressure per paragraphs 6.5 and 6.6 if necessary.

6.8 PEN CLEANING

Intermittent, missing, or faint traces may be indications of a clogged pen. The following cleaning procedure is intended as a guide, but may not always prove effective.

1. Turn recorder OFF.

2. Close both ink valves.

3. Remove ink tubing from manifold.

4. Remove pen (Para. 6.7a or 6.7b).

NOTE: Do not remove tubing from pen unless tubing is kinked or suspected of being defective. (If new ink tubing is required, analog tube part number is 683594-1 and event marker tube is 666587-1.)

5. Modify No. 18 hypodermic needle per Figure 6-10.

6. Attach modified needle onto 2cc hypodermic syringe.

7. With syringe plunger depressed, insert needle in pen tubing.

8. Immerse pen tip in cleaning agent (Isopropyl Alcohol, Cell-O-Solve or equivalent.)

9. Back-flush by slowly withdrawing syringe plunger.

NOTE: It may be necessary to allow the pen to remain for a brief period in the cleaning agent to dissolve dried ink at pen tip.

10. Install pen (para. 6.7a or 6.7b).

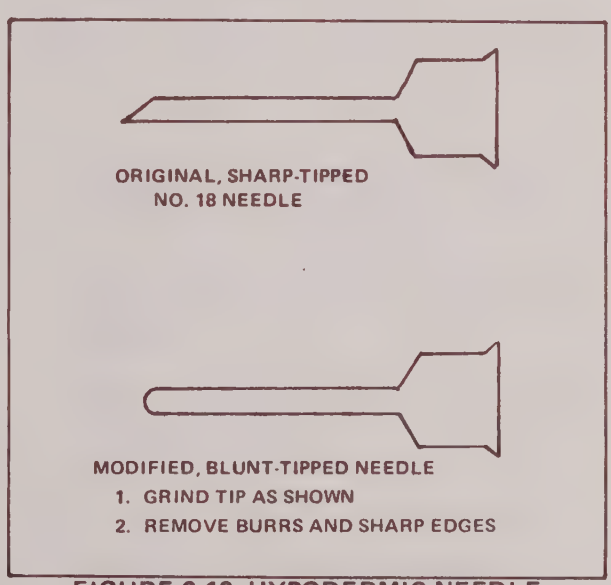


FIGURE 6-10 HYPODERMIC NEEDLE MODIFICATION

6.9 CASE REMOVAL

When removing the case, be careful not to damage gears or switchboard.

1. Remove four large machine screws from bottom of case.

2. If recorder is equipped with preamplifiers, remove channel 2 preamplifier, slide hand into preamp cage, and unplug connector. Pull from connector body, not from harness.

3. Slide recorder out from front of case. Push from rear and/or pull from side plates. Do not pull from top front of recorder.

6.10 DRIVE ASSEMBLY REPLACEMENT

NOTE: Refer to illustrated parts breakdowns of Recorder Assembly, L.H. Plate Assembly, Chassis Assembly, and Drive Assembly in Section VIII.

WARNING: MAKE SURE POWER IS TURNED OFF AND RECORDER IS DISCONNECTED FROM POWER SOURCE.

Remove the drive assembly as follows:

1. Remove case per paragraph 6.9.

2. Remove rear cover assembly (item 61) from recorder assembly.

3. Refer to L.H. Plate assembly. Item 10 is TB-102. Unplug four motor leads. Blue lead, terminal 2; Orange lead terminal 5; Green lead terminal 5; and Black lead terminal 6.

4. Refer to Chassis Assembly. Item 6 is T-109, the control transformer. Remove screws and nuts holding it onto chassis bottom (item 4). Move transformer clear of Drive Assembly (item 1). DO NOT DISCONNECT ANY LEADS FROM TRANSFORMER.

5. Refer to Recorder Assembly. Remove timing belt (item 25) and pulley (item 24) from recorder assembly.

6. Refer to Chassis Assembly. Remove 3 machine screws securing transmission to right hand plate assembly and 2 screws securing motor mounting bracket to chassis.

7. Slide Drive Assembly partially out of Recorder Assembly.

8. Unplug 5 leads from transmission.

9. Remove Drive Assembly completely from Recorder Assembly.

10. Slide new or repaired Drive Assembly partially into Recorder Assembly Plug leads onto transmission terminals as follows:

TERMINAL	LEAD COLOR
A	Wht/Blk/Grn
B	Wht/Blk/Yel
C	Wht/Blk/Orn
D	Wht/Blk/Red
E	Wht/Blk/Brn

11. Slide Drive Assembly in place in recorder. Assemble in reverse order of disassembly procedure.

6.11 POWER TRANSFORMER REPLACEMENT

NOTE: Refer to illustrated parts breakdown of chassis assembly in Section VIII.

WARNING: MAKE SURE POWER IS TURNED OFF AND RECORDER IS DISCONNECTED FROM POWER SOURCE.

Replace power transformer(s) (item 5) as follows:

1. Remove recorder from case per paragraph 6.9.

2. Remove paper supply roll per paragraph 6.3 if transformer(s) to be replaced is T-103 thru T-108. (T-103 shown in illustration).

3. Remove rear cover assembly (item 61) from recorder assembly if T-101 or T-102 is to be replaced.

4. Note terminal/color code lead connections while disconnecting lugs and before transformer removal.

NOTE: Twelve connections per transformer as follows:

1) Eight lugs on top of transformer.

2) Four leads at bottom of transformer which terminate at TB-103A or TB-103B.

5. Remove two machine screws securing transformer to chassis (4).

6. Slide out defective transformer and replace.

7. Secure transformer with machine screws.

8. Replace paper supply roll or rear cover assembly and install recorder in case.

6.12 TABLE ASSEMBLY REPLACEMENT

NOTE: Refer to illustrated parts breakdown of Writing Table assembly in Section VIII.

Replace table assembly as follows:

1. Remove recorder from case per paragraph 6.9.
2. Remove paper supply roll per paragraph 6.3.
3. Remove retaining rings from table arms and carefully pry arms out of plate assemblies. Do not bend arms.
4. Tilt table slightly and pull out of recorder removing right and left hand lever assemblies.
5. Mount new or repaired table assembly on lever assemblies. Slide table into recorder and snap arms into side plate holes. Replace retaining rings.
6. Replace paper supply roll and install recorder in case.

*6.13 MANIFOLD ASSEMBLY REPLACEMENT

NOTE: Refer to illustrated parts breakdown of recorder assembly in Section VIII.

Replace manifold assembly (item 16) as follows:

1. Remove recorder from case per paragraph 6.9.
2. Turn OFF cartridge(s) and all ink valves.
3. Place paper towels around area underneath manifold assembly.
4. Pull off ink tubing from manifold to pens and manifold to valve assemblies.
5. Remove four machine screws which secure manifold assembly to side plates. Lift out manifold assembly.
6. Install new or repaired manifold assembly.
7. Replace all tubing to manifold assembly.
8. Turn ON ink cartridge(s) and ink valves. Check for leaks.
9. Install recorder in case.

6.14 PENMOTOR REPLACEMENT

NOTE: Refer to illustrated parts breakdowns of recorder assembly, manifold assembly and penmotor bar assembly.

Replace penmotor as follows:

1. Remove recorder from case per paragraph 6.9.
2. Turn off left or right ink valve depending on which one feeds penmotor to be replaced.
3. Place paper towels around area underneath penmotor to be replaced.
4. Remove ink tubing from pen assembly.
5. Remove paper supply roll (see paragraph 6.3).
6. Remove pen assembly by loosening the two screws which secure it to drive arm and carefully slide off. Refer to Figure 6-9.
7. Disconnect plug, then remove two socket head screws which secure penmotor to penmotor bar. Pull penmotor out of recorder. The saddle is a loose part.
8. Install new penmotor, securing with the two socket head screws. Connect plug to penmotor.
9. Replace paper supply roll and close table.
10. Install pen assembly per paragraph 6.7a.
11. Install recorder in case.

***Refer to paragraph 6.16 as part of replacement procedure.**

6.15 REPLACING PENMOTOR DRIVE BAND (685270)

CAUTION: IT IS RECOMMENDED THAT THE DRIVE BAND BE REPLACED AT THE FACTORY SO THAT PROPER BAND TENSION IS MAINTAINED. SHOULD FIELD REPLACEMENT BECOME NECESSARY, PERFORM THE FOLLOWING STEPS.

NOTE: Refer to Figure 6-11 for location of parts in capital letters.

a. Band Removal

1. Remove Analog Pen Assembly.
2. Loosen (but do NOT remove) screws securing REAR BAND CLAMP.
3. Remove screw from front end of assembly. (FRONT BAND CLAMP will fall away from assembly with screw.)
4. Remove band by sliding free end in counter-clockwise direction thru BAND ANCHOR and REAR BAND CLAMP; then over TRANSITION PIECE attached to drive arm assembly.
5. Conclude removal by gently pulling band from BAND ANCHOR.

b. Band Replacement

1. Place hooked (or bent) end of DRIVE BAND over BAND ANCHOR as shown, and restring in clockwise direction over TRANSITION PIECE, and between BAND ANCHOR and REAR BAND CLAMP. Slot in DRIVE BAND should line up with hole in TRANSITION PIECE.
2. Replace screw and FRONT BAND CLAMP. Snugly tighten all screws, front and rear.
3. Apply 5.5 to 6.5 lbs of tension to free end of band with spring tension scale or other means.
4. Maintaining tension, fully tighten all screws and apply Glyptal cement (Gould P/N 11370) or equal at screwheads and mating surfaces.
5. Remove tension; then replace analog pen.
6. Check frequency response for compliance with specifications given in Section I.

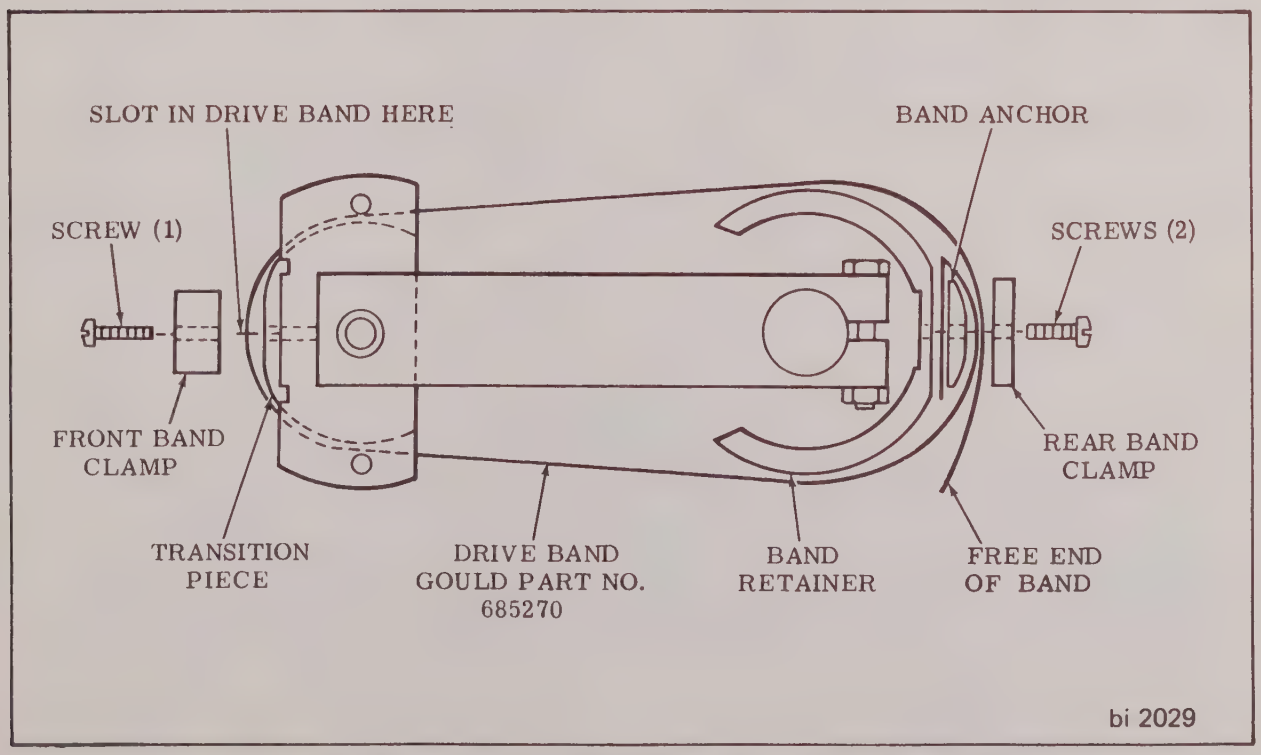


FIGURE 6-11 PENMOTOR DRIVE BAND REPLACEMENT

6.16 MANIFOLD BLEEDING PROCEDURE

a. General

After changing or replacing the manifold assembly, it is imperative that the inking system is bled before operating the recorder. This is necessary so that any air trapped in the system is removed to guarantee uninterupted writing. It may be desirous to bleed the system when changing ink cartridges also.

b. Bleeding Procedure

1. Close all ink valves including those mounted on manifold (20) and both main valves which are part of valve and solenoid assembly. (see Figure 6-12).

2. Remove all pen tubing from manifold nipples (18) and cover nipples with ink outlet caps (*PN 249360).

3. Place inking system under pressure by turning **activating screws** on ink plunger assemblies **counterclockwise** until ink fills tubing linking ink cartridges with main valves.

4. Open both main valves (part of valve & solenoid assembly). Push hinged main valve assemblies closed toward rear of recorder). Solenoid plunger will close, opening diaphragms in valve assemblies. Hold closed. Ink should fill tubing linking main valves and 2 end manual valves.

5. Open 2 end manual valves by sliding them in the directions of the arrows on the manifold bar to the "ON" position. Both manifolds should fill with ink.

6. Place paper towels under capped manifold nipples at this point.

7. Remove ink outlet caps from 2 nipples in the middle of the manifold bar. (These 2 nipple valves are the farthest from the 2 points where ink is supplied to the manifold.

8. Allow a few drops of ink to drip from each nipple by sliding the valves directly behind them in the direction of the arrow to "INK ON".

9. Turn the ink off by sliding the valves in the direction of the arrow to "INK OFF". Wipe the nipples free of excess ink and replace the ink outlet caps.

10. Repeat steps 7 thru 9 for next closest set of nipples to manifold ink sources and so on until all 9 sets of nipples are bled.

11. Replace ink outlet caps with pen tubing where removed in step 2.

*Ordered separately from manifold assembly. 18 required.

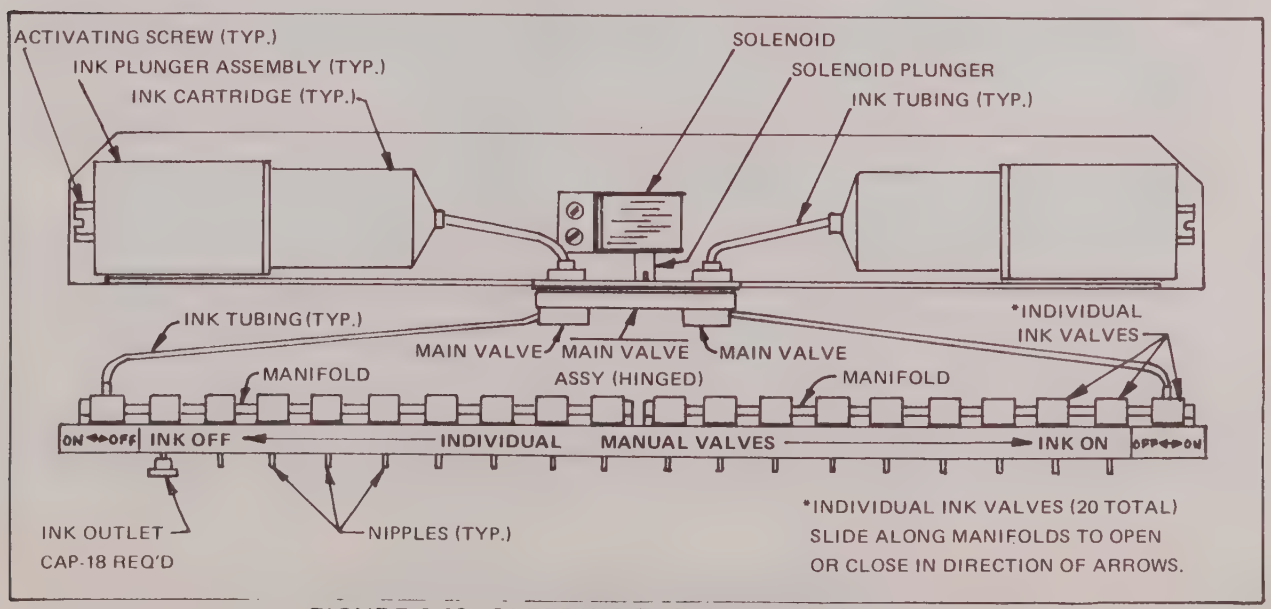


FIGURE 6-12 BLEEDING THE INKING SYSTEM

SECTION VII

CALIBRATION

7.1 GENERAL

The Gould 2800 Series Recorder has been factory calibrated. Under normal conditions, calibration will not be required. However, it may be required when parts are replaced. This section describes the procedures necessary to calibrate the 2800 Series Recorder. Calibration should only be performed by qualified individuals.

7.2 TEST EQUIPMENT REQUIRED

Proper test equipment is essential. Use the equipment specified below or its equal.

a. Function Generator — Wavetek Model 110.

b. DC Calibration Source — Digitec Model 311.

CERT Aid (L I)

7.3 PRELIMINARY SETUP

a. If the recorder contains preamplifiers, remove each preamplifier from its cage prior to calibrating the channel.

b. Depress recorder STOP button.

c. Plug ac line cord into the proper ac voltage source.

d. Turn ON the recorder.

7.4 CALIBRATION PROCEDURE

Calibration is required on pen drive amplifiers (one per channel) and preaplifiers (if recorder is so equipped). Only pen drive amplifier calibration is discussed in this manual. Refer to the applicable preamplifier manual for its calibration.

Calibration controls and procedures are identical for all channels. Refer to Figure 7-1 and calibrate each pen drive amplifier as follows:

1. Remove the Recorder top rear cover to gain access. Slide cover back and lift out. (If recorder is rack mounted, slide recorder out of rack.)

2. Connect dc calibration source to phone jack input of drive amplifier. Tip is high, ring is low.

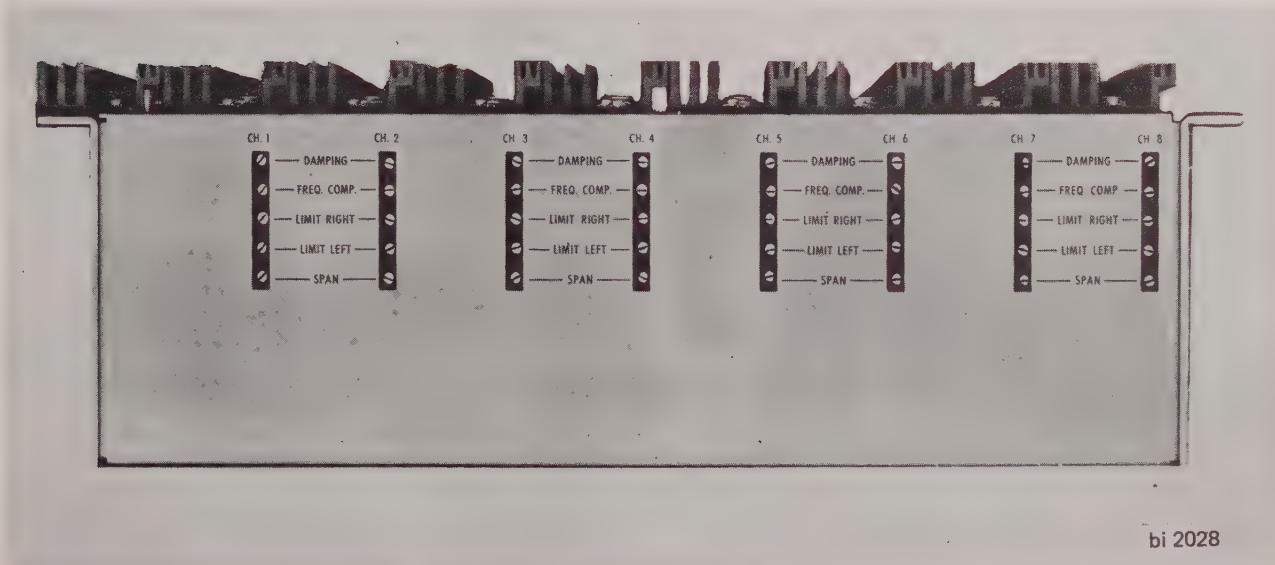


FIGURE 7-1 CALIBRATION CONTROLS

3. Press recorder 5mm/sec CHART SPEED push-button.

4. Set dc calibration source to ZERO.

5. Set pen at channel center with pen position control.

6. Apply a ±2.5 vdc ±0.25 mv signal to drive amplifier and adjust SPAN potentiometer (R-260) for full scale deflection within 0.1%.

7. Return dc calibration source to zero.

8. Turn pen position control full counterclockwise. Pen should deflect left to between 1.0 and 2.0 mm beyond full scale.

9. If deflection is NOT between 1.0 and 2.0 mm beyond full scale, adjust LEFT LIMIT potentiometer (R-208) for a 1.5 ±0.25 mm deflection beyond full scale.

10. Turn pen position control full clockwise. Pen should deflect right to between 1.0 and 2.0 mm beyond full scale.

11. If deflection is NOT between 1.0 and 2.0mm beyond full scale, adjust RIGHT LIMIT potentiometer (R-205) for a 1.5 ±0.25 mm deflection beyond full scale.

12. Connect function generator.

13. Apply a 4V p-p square wave with a 1.0Hz repetition rate.

14. Turn DAMPING potentiometer (R-231) clockwise until an overshoot is obtained. Then, turn slowly counterclockwise until overshoot is reduced to zero.

15. Check overshoot at 20 and 100 percent pen deflection. No overshoot should be present. Repeat Step 14 if necessary.

16. Increase chart speed to 25 mm/sec.

17. Apply a 5Hz sine wave, and adjust amplitude to obtain a 40 mm pen deflection.

18. Slowly increase frequency to 60Hz. Pen deflection should be within 0.5 mm of that at 5Hz.

19. If necessary, adjust FREQUENCY COMP potentiometer (R-209) until 60Hz deflection is within 0.5 mm of the 5Hz deflection.

SECTION VIII

PARTS IDENTIFICATION

8.1 GENERAL

This Gould 2800 Series Recorder has been accurately calibrated and adjusted before shipment from the factory, and should give long trouble-free service. For servicing beyond the scope of the instructions contained in this manual or the technical equipment available, contact your nearest Gould Service Engineer listed on the warranty card shipped with the recorder.

The following parts lists and schematic diagram are designed to assist in servicing and repairing the recorder. For replacement parts, refer to the appropriate Figure and Parts List that follow. The items listed do not necessarily imply they are procurable. If an item is marked with an asterisk (*), it is not procurable.

To assure prompt and satisfactory delivery of replacement parts, include the following information with your purchase order:

1. Name and model number of the instrument.
2. Description of part as listed in this manual.
3. Gould part number.

NOTE: Do not use the SYMBOL NUMBER from the parts list for identifying desired parts on the order.

8.2 PARTS USED ON OTHER MODELS

The USED ON column identifies the recorder on which the part is used. If on code is not present, part is common to all models. Below are the codes and explanations:

CODE	EXPLANATION
380-8	380mm Chassis without preamps.
380-8P	380mm Chassis with preamps.

EXPLODED VIEW PARTS LIST
2800 SERIES RECORDER – ALL PORTABLE MODELS
FIGURE 8-1

ITEM NUMBER	PART NUMBER	DESCRIPTION	USED ON
	2007-88XX-XX	2800 Recorder, 8-Channel	
1	2007-8890-XX	Recorder Assy (See Figure 8-3)	
2	887149	Case Assy, Recorder-w/o preamps (See Fig. 8-17)	380-8
	887709	Case Assy, Recorder-w/preamps (See Fig. 8-17)	380-8P
3	287674	Cover, Rear	
4	287083	Bracket, Angle	380-8P
5	287084	Plate, Support	380-8P
6	887717	Cage Assy, Preamp (See Fig. 8-18)	380-8P
7	11-6402-12	Take-Up Assy (See Fig. 8-22)	

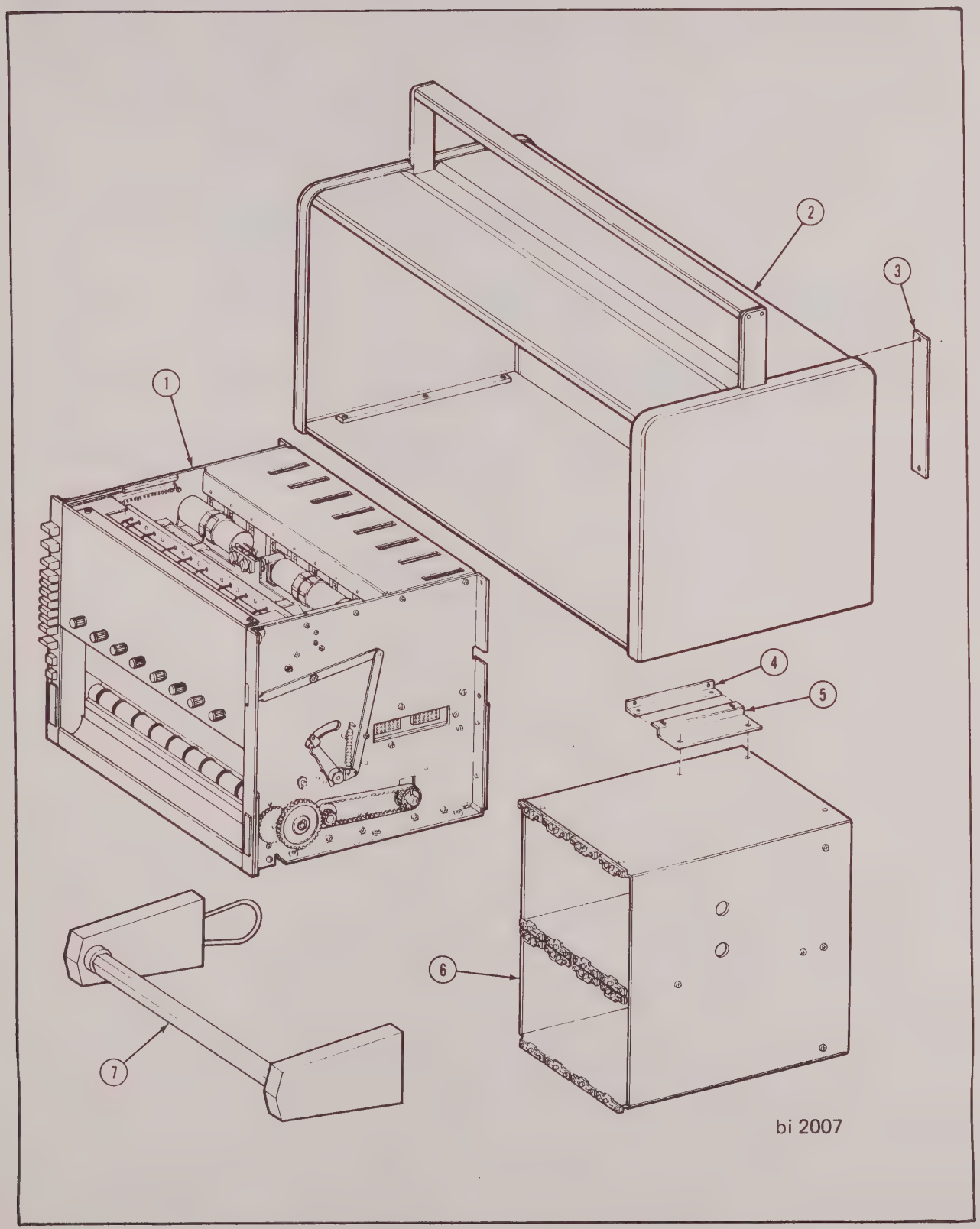


FIGURE 8-1 2800 SERIES RECORDER, PORTABLE

EXPLODED VIEW PARTS LIST
2800 SERIES RECORDER – RACK MOUNTED MODELS
FIGURE 8-2

ITEM NUMBER	PART NUMBER	DESCRIPTION
	2007-88XX-XX	2800 Recorder - 8 Channel
1	2007-8890-XX	Recorder Assy (See Figure 8-3)
2	467037	Frame, Shipping
3	11-1154-61	Cabinet Assembly
4	11-6402-12	Chart Take-up Assy (See Fig. 8-22)
Not Shown	**688001	Kit Assy, Model 11-1202-14 (See Fig. 8-20) (Rack Mount Installation Instructions, Recorder)
Not Shown	**687319	Kit Assy, Model 11-1202-15 (See Fig. 8-21) (Rack Mount Installation Instructions, Preamp Cage)

**Use Kit Model number for ordering purposes.

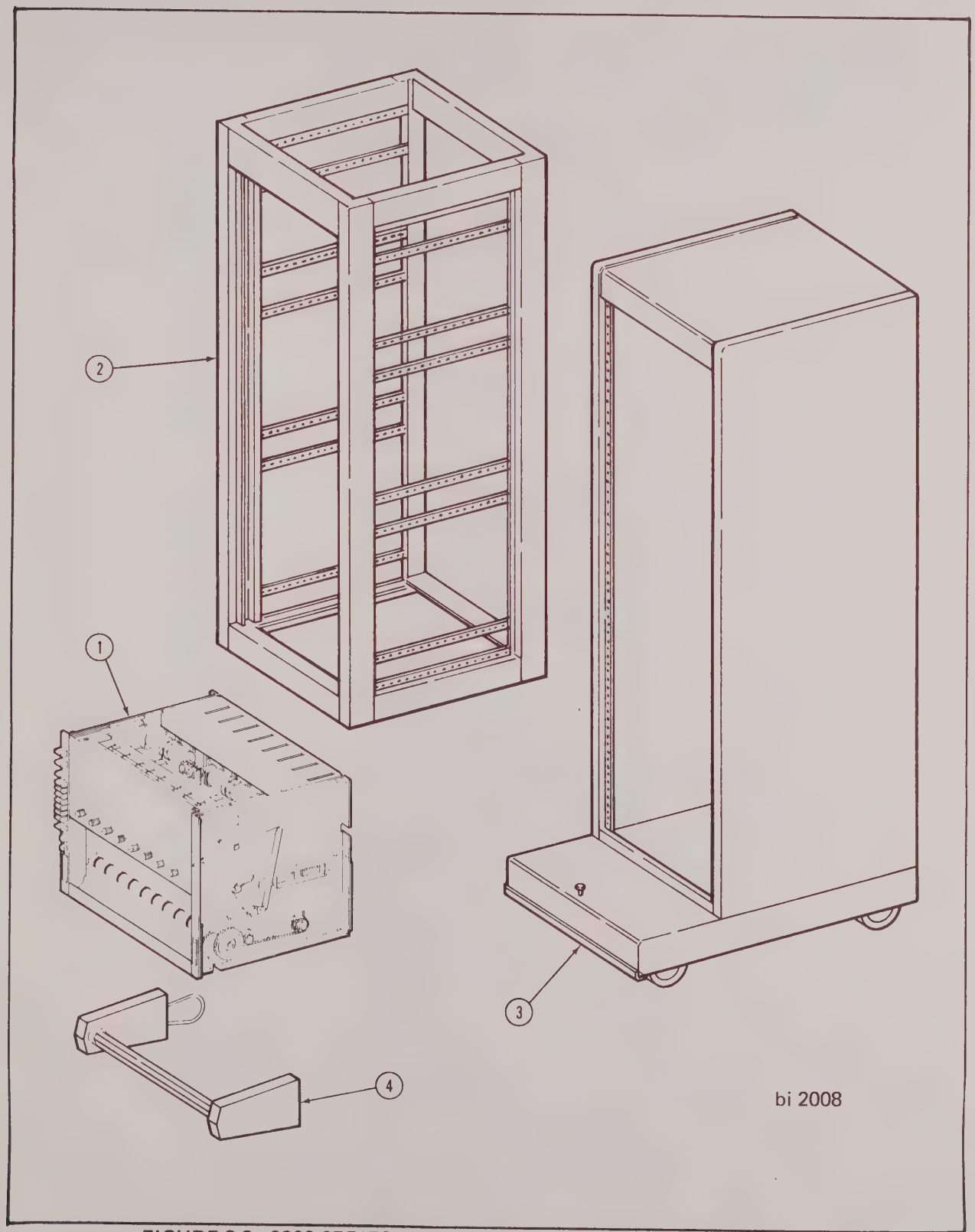


FIGURE 8-2 2800 SERIES RECORDER, RACK MOUNTED MODELS

EXPLODED VIEW PARTS LIST
2800 SERIES RECORDER – ALL MODELS
RECORDER ASSEMBLY
FIGURE 8-3

ITEM NUMBER	PART NUMBER	DESCRIPTION	SYMBOL NUMBER	USED ON
	2007-8890-XX	Recorder Assy - 380mm Chassis		
1	285651-3	Knob		
	787120-3	Door Assy		
2	286316-2	Cover		
3	787423	Door Subassy		
4	286091-2	Spring		
5	687104	Hinge		
6	387111	Slide		
7	289046	Plug Monitor		P-202
8	114816-15	Plug Input		P-201
9	11-2823-35	Pen Assy, Analog (includes ink tube)		
10	285711	Spring		
11	243225-6	Clamp		
12	887706	Connector Assy (See Fig. 8-6)		
13	11-2873-20	Pen Assy, Event Marker (includes ink tube)		
14	666587-1	**Ink Tube (Event Marker Pen)		
15	687477-1	**Ink Tube (Analog Pen)		
16	787753	Manifold Assy		
	249360	Ink Outlet Cap (Covers Valve Nipples)		
17	887752	Valve & Solenoid Assy (115V)		
17	887752-1	Valve & Solenoid Assy (230V)		
18	766243	Ink Plunger Assy		
18A	11-2730-01	Ink Cartridge		
18B	1-282285-3	Solenoid (115V)		
18C	1-282285-4	Solenoid (230V)		
18D	684169-2	Valve Assy (Not Shown)		
19	666582	Ink Tube (Connects Valve Assy to Manifold)		
*20	887749	Bar Assy, Penmotor (See Fig. 8-11)		
21	116198-X	Fuse (115V Models) } See Table 8-1, Fuse Table		
21	266924-X	Fuse (230V Models) } Following Fig. 8-3 Parts List		
22	886327	Board Assy, Control (See Figure 8-8)		
23	886220	Board Assy, Drive Amp (See Figure 8-7)	A101 thru A108	
24	385806	Pulley		
25	243542-6	Belt, Timing		
26	385710	Gear, Pulley		
27	269491	Gear, Dual		
28	127271	Washer		
29	1-227070-9	Ring, Ret.		
30	241513-206	Capacitor (115V)		C-108
30	231449-27	Capacitor (230V)		C-108
*31	887707-X	Chassis Assy, (See Fig. 8-9. Part Number suffix defined in Fig. 8-9 Parts list.)		

*Item 20 is not procurable. Order from Fig. 8-11 itemized parts list.
*Item 31 is not procurable. Refer to Figure 8-9 itemized parts list.

**Not Required if Pen Assy is ordered.

EXPLODED VIEW PARTS LIST
2800 SERIES RECORDER – ALL MODELS
RECORDER ASSEMBLY (Continued)
FIGURE 8-3

ITEM NUMBER	PART NUMBER	DESCRIPTION	SYMBOL NUMBER	USED ON
	886940	Harness Assy, Transmission		
32	1-283408-2	Contact, Elect.		
33	265760-1	Contact, Elect.		
34	12-2202-16	Transmission and Motor Assy 115V/400Hz ÷ 100		
34	12-2203-16	Transmission and Motor Assy 115V/400Hz ÷ 60		
	762529	Motor & Gear Assy		
	887100	Transmission ÷ 100		
	887251	Transmission ÷ 60		
	262530	Spacer, Sleeve		
	687102	Plate, Junction		
35	887128-1	Table Assy, Writing (See Fig. 8-12)		
36	786396	Panel Assy, Front		
37	286770	Cover, Panel		
38	787110	Shaft Assy, Supply		
39	785718	Flange Assy, Supply		
40	285764-4	Lens		
41	285764-1	Lens		
42	786393	Panel Assy, Front, L.H.		
43	285765-1	Lamp	DS-101,DS-102	
44	685196-2	Lampholder Assy		
45	685196-1	Lampholder Assy		
46	286767	Insulator		
47	886772	Board Assy, Switch (See Fig. 8-4)	A-110	÷100 Models
47	886772-1	Board Assy, Switch (See Fig. 8-4)	A-110	÷60 Models
48	289227-3	Shield, Insulator		
49	1-280875-7	Spacer, Threaded		
50	265840-1	Terminal Lug		
51	887129-1	Bracket Assy, Shield 60Hz (See Fig. 8-14)		
51	887129-3	Bracket Assy, Shield 50Hz (See Fig. 8-14)		
51	787234	Bracket Assy, Shield 400Hz (See Fig. 8-14)		
52	787113	Shield		
53	108572-11	Strain, Relief		
54	681257-1	Cable Assy, Rear		
55	244165	Connector, Recept		J-102
56	129699	Jumper		
57	289225-4	Shield		
58	1-280875-8	Spacer, Threaded		
59	1-286155-24	Terminal Board		TB-101
60	787677	Cover Assy, Rear		
61	787112	Cover Assy, Rear 50/60Hz		
61	787224	Cover, Assy, Rear 400Hz		
62	887664	Bracket Assy, Top		

EXPLODED VIEW PARTS LIST
2800 SERIES RECORDER – ALL MODELS
RECORDER ASSEMBLY (Continued)
FIGURE 8-3

ITEM NUMBER	PART NUMBER	DESCRIPTION	SYMBOL NUMBER	USED ON
63	1-286404-1	Fan, Motor 115/50/60Hz	B-102	
63	1-286404-2	Fan, Motor 230/50Hz	B-102	
63	1-286690-1	Fan, Motor 115/400Hz	B-102	
64	887647	Bracket Assy, Bottom		
65	265840-2	Terminal Lug (Lugs on B-102 Cable ends)		
66	887760	Plate Assy, R.H. (See Fig. 8-15)		
67	686429	Indicator Assy		
68	11-125110-1104	Rivet		
69	1-227070-3	Ring, Ret.		
70	286592	Spring		
71	683485	Brake Assy (See Fig. 8-16)		
72	286531	Spring		
73	269499	Gear, Spur		
74	1-227070-9	Ring, Ret.		
75	127271	Washer		
76	265741-1	Bearing, Ball		
77	265745-1	Washer, Mylar		
78	785701-2	Chute, Paper		
79	267426-2	Paper Deflector		
80	687103	Roll, Drive		
81	285357-2	Shaft		
82	743915-10	Arm Assy Sensor		
83	783590	Sensor Assy (See Fig. 8-13)		
84	241026-2	Terminal Lug (Attached to TB-102)		
85	887758	Plate Assy, L.H. (See Fig. 8-5)		
86	2-240731-10	Ring, Ret. Ext.		
87	248169-2	Spacer		
88	242461-45	Nut		
89	691288	Jumper Assy (Not Shown. Connects inner surface of Door Assy, item 3, and inner surface of R.H. Plate Assy, item 66).		

TABLE 8-1 2800 SERIES RECORDER FUSE TABLE – All Models (Item 21, Fig. 8-3 Parts List)

FUSE SYMBOL	LINE VOLTAGE & FREQUENCY			
	115V/60HZ	115V/50HZ	115V/400HZ	230V/50HZ
F101 thru F108	116198-9 3/4A, 125V	116198-10 1A, 125V	116198-9 3/4A, 125V	266924-7 1/2A, 250V
F109	116198-6 1/4A, 125V	116198-7 3/8A, 125V	116198-6 1/4A, 125V	266924-2 1/4A, 250V
F110	116198-6 1/4A, 125V	116198-6 1/4A, 125V	116198-6 1/4A, 125V	266924-4 1/8A, 250V
F111	116198-6 1/4A, 125V	116198-6 1/4A, 125V	116198-6 1/4A, 125V	266924-4 1/8A, 250V
F112	116198-11 1.5A, 125V	116198-11 1.5A, 125V	116198-36 7A, 125V	266924-6 3/4A, 250V
F113	116198-13 3A, 125V	116198-13 3A, 125V	116198-13 3A, 125V	266924-1 1.5A, 250V

NOTE: All Fuses located on Control Timer Board Assembly (886327).

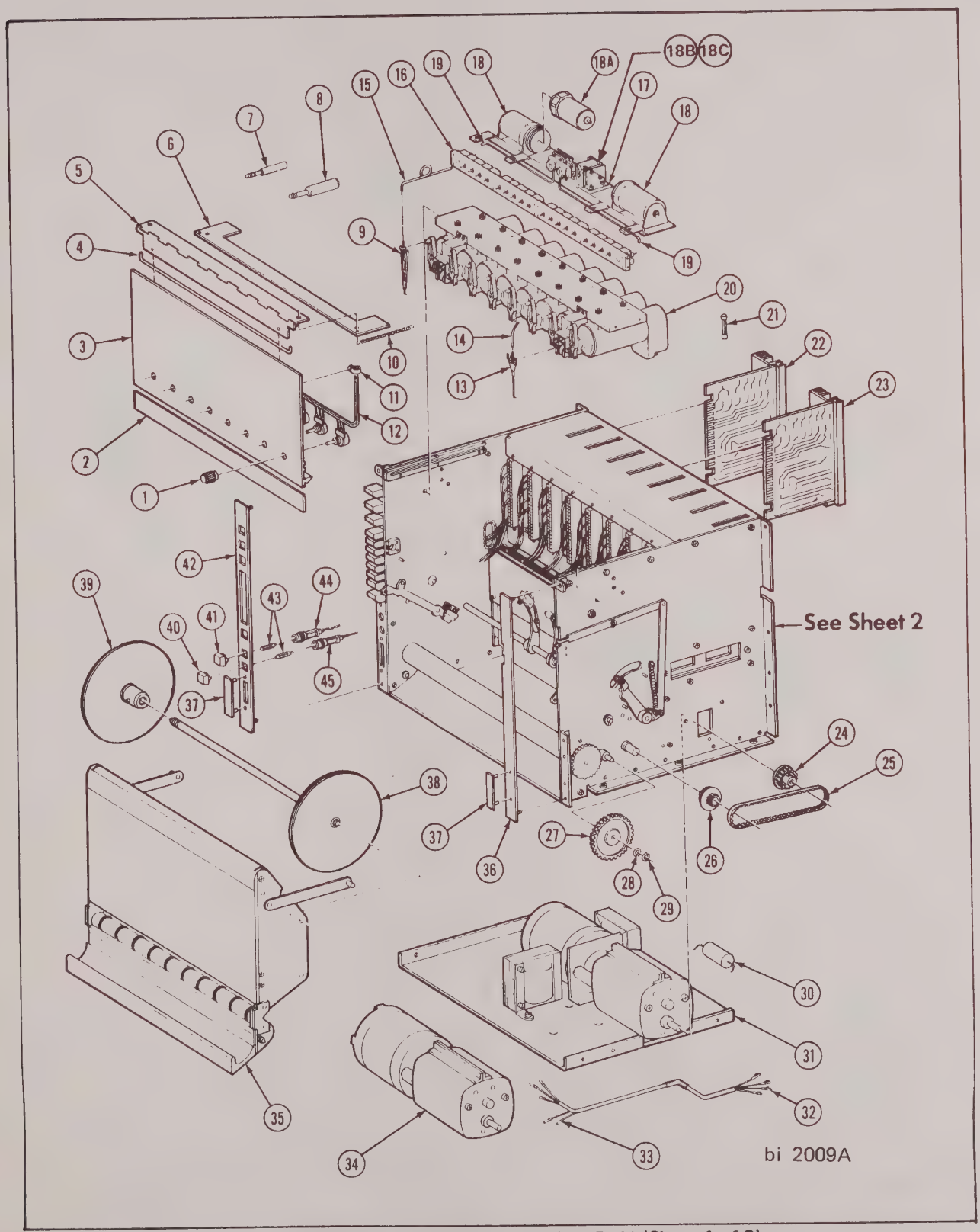


FIGURE 8-3 RECORDER ASSEMBLY (Sheet 1 of 2)

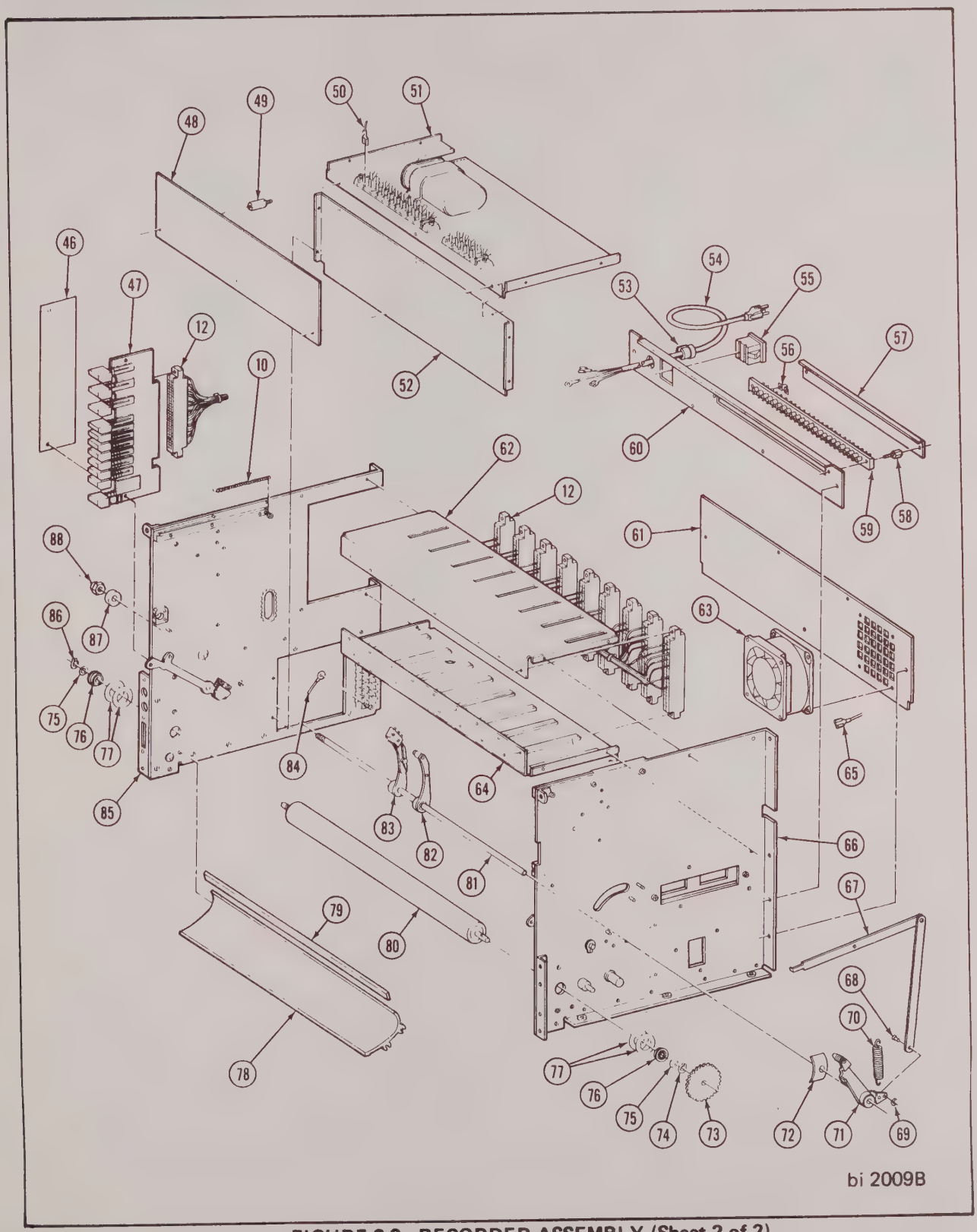


FIGURE 8-3 RECORDER ASSEMBLY (Sheet 2 of 2)

EXPLODED VIEW PARTS LIST
2800 SERIES RECORDER – ALL MODELS
SWITCHBOARD ASSEMBLY
FIGURE 8-4

ITEM NUMBER	PART NUMBER	DESCRIPTION	SYMBOL NUMBER	USED ON
	886772	Switchboard Assy		÷ 100 Models
	886772-1	Switchboard Assy		÷ 60 Models
1	385804	Board Printed Circuit		
2	285758	Switch, Speed Select	S-101	
3	786080-1	Button, Switch – "POWER"		
	786080-2	Button, Switch – "STOP"		
	786080-3	Button, Switch – "5"		
	786080-4	Button, Switch – "10"		
	786080-5	Button, Switch – "25"		
	786080-6	Button, Switch – "50"		
	786080-7	Button, Switch – "100"		
	786080-8	Button, Switch – "200"		
	786080-9	Button, Switch – "÷ 100"		÷100 Models
	786080-10	Button, Switch – "LEFT"		
	786080-11	Button, Switch – "RIGHT"		
	786080-12	Button, Switch – "÷ 60"		÷ 60 Models
4	265763-3	Contact		

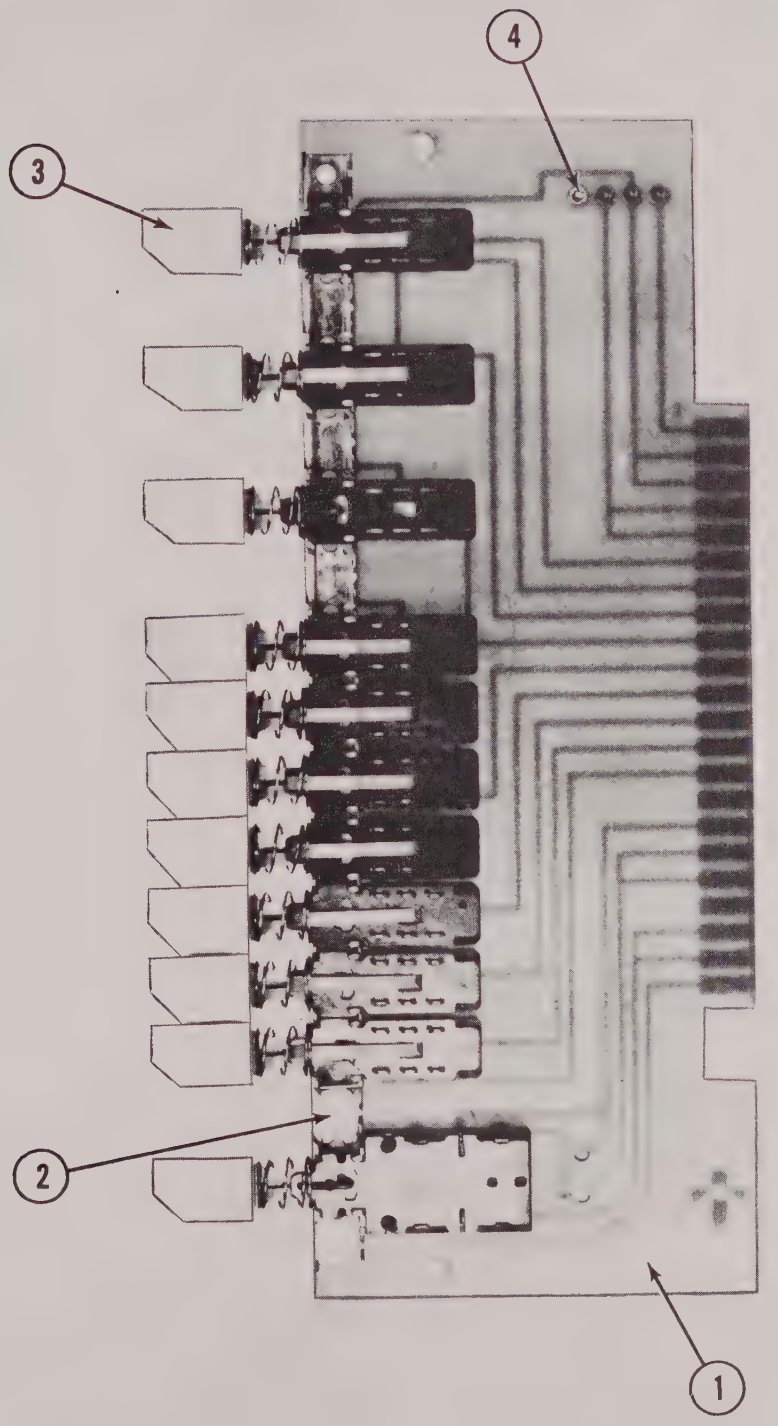


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FIGURE 8-4 SWITCHBOARD ASSEMBLY

EXPLODED VIEW PARTS LIST
2800 SERIES RECORDER – ALL MODELS
LEFTHAND PLATE ASSEMBLY
FIGURE 8-5

ITEM NUMBER	PART NUMBER	DESCRIPTION	SYMBOL NUMBER	USED ON
	887758	Plate Assy, L.H.		
1	285929	Bracket, L.H.		
2	127271	Washer		
3	1-227070-9	Ring, Retaining		
4	285599	Catch		
5	286015-1	Filter, RFI	FL-101	
6	1-265849-4	Bracket		
7	385619	Bracket, Conn.		
8	385543-2	Guide		
9	2-128693-3	Grommet		
10	265814-6	Terminal Board	TB-102	
11	243622	Pad, Friction		
12	243623	Spring		
13	243611-910	Lever Assy		
	887757	Plate Subassy		
14	243440	Bumper		
15	243507	Button, Detent		
16	1-127657-5	Ring, Retaining		

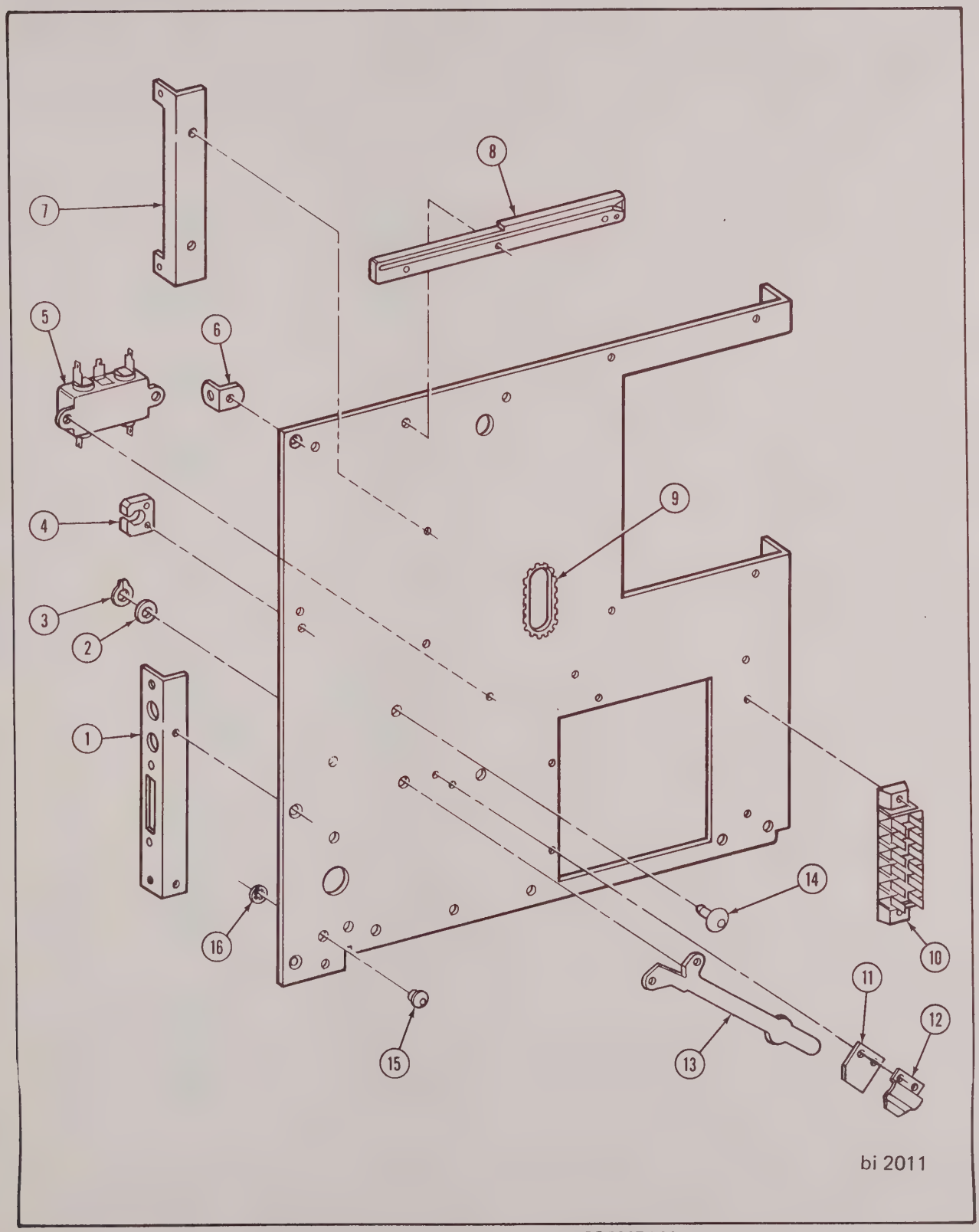


FIGURE 8-5 LEFT HAND PLATE ASSEMBLY

EXPLODED VIEW PARTS LIST
2800 SERIES RECORDER – All Models
CONNECTOR ASSEMBLY
FIGURE 8-6

ITEM NUMBER	PART NUMBER	DESCRIPTION	SYMBOL NUMBER	USED ON
	887706	Connector Assy		
	887703	Harness Assy		
1	265915-1	Terminal Lug		
2	284700	Key, Polarizing		
3	283420-44	Connector	XA109,XA110	
4	1-283408-2	Contact, Elec.		
5	270160-1	Terminal Lug		
6	265840-1	Terminal Lug		
	785089	Harness Assy, Power Transformer		
7	1-283408-2	Contact, Elec.		
8	265840-1	Terminal Lug		
	887675	Harness, Pen Position		
9	10-286044-103	Resistor, Variable	R-101 thru R-108	
10	1-283408-1	Contact, Elec.		
	785087	Harness Assy, Penmotor		
11	9-281501-82	Connector	XM101 thru XM108	
12	281506-3	Contact, Elec.		
13	1-283408-2	Contact, Elec.		
	887705	Harness Assy		
14	1-283408-2	Contact, Elec		
15	283420-44	Connector	XA101 thru XA108	
16	284700	Key, Polarizing		
17	270154-1	Contact, Elec.		
18	9-270159-2	Connector	P105,P106	
19	0-270156-1	Connector	J-103, T-104	
20	286594-1	Terminal Lug		
21	265915-1	Terminal Lug		
22	265840-1	Terminal Lug		
23	286598	Commoning Spring		
24	1-283408-2	Contact, Elec		
25	265840-1	Terminal Lug		
*25A	692370	Resistor Assy	R301	
	785089-1	Harness Assy		
26	265840-1	Terminal Lug		
27	1-283408-2	Contact, Elec.		

*NOTE: Item 25A is used only with 40mm channel width.

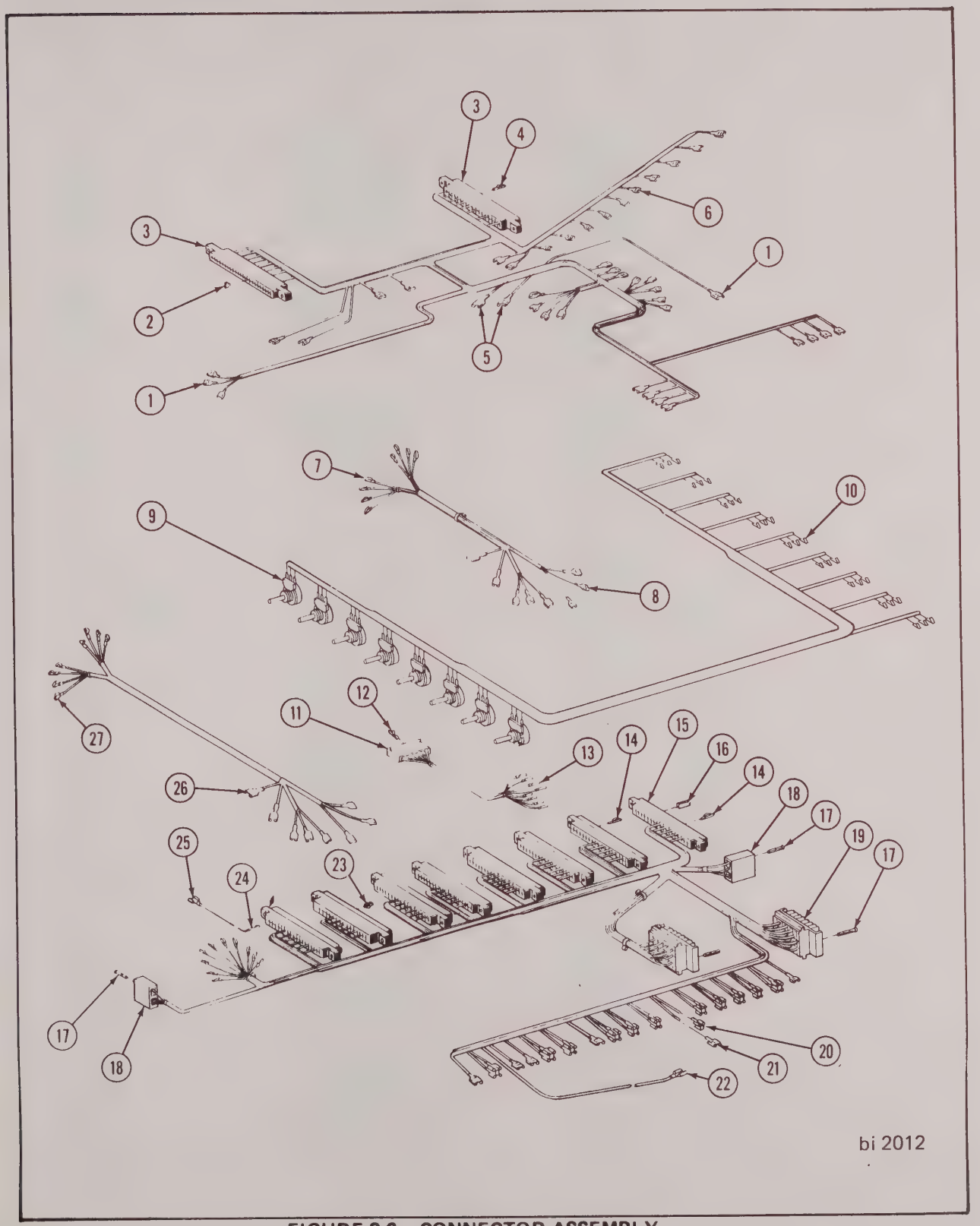


FIGURE 8-6 CONNECTOR ASSEMBLY

ELECTRICAL PARTS LIST
2800 SERIES RECORDER – ALL MODELS
BOARD ASSEMBLY, DRIVE AMPLIFIER – 886220
FIGURE 8-7

SYMBOL NUMBER	PART NUMBER	DESCRIPTION
C201	10-125904-223	Capacitor
C202	10-247116-102	Capacitor
C203, 204	10-247116-103	Capacitor
C205	240352-501	Capacitor
C206	10-247116-103	Capacitor
C207	240352-501	Capacitor
C208	262585-106	Capacitor
C209	10-247116-103	Capacitor
C210, 211	10-247116-102	Capacitor
C212	240352-202	Capacitor
C213	10-125904-503	Capacitor
C214	10-125904-223	Capacitor
C215	281509-507	Capacitor
C216	262585-106	Capacitor
C217	281509-507	Capacitor
C218	262585-106	Capacitor
C219-222	286010-108	Capacitor
CR201, 202	263727	Diode, 1N961B
CR203-208	270508	Diode, 1N4454
CR209, 210	286018-1	Diode, MDA-101
CR211	269256-7	Diode, 1N4007
Q201	281703-2	Transistor, 2N4403
Q202	281702-2	Transistor, 2N4401
Q203-205	286141	Transistor, 2N3904
Q206	1-230057-3	Transistor, 2N4923
Q207	1-286145-1	Transistor, 2N5982
Q208	1-230058-3	Transistor, 2N4920
Q209	1-286147-1	Transistor, 2N5985
Q210	281857-2	Transistor, 2N5033
R201	1-281851-30002	Resistor
R202	1-281851-10002	Resistor
R203	1-281851-43201	Resistor
R204	1-281851-10002	Resistor
R205	282299-103	Resistor
R206, 207	1-281851-69000	Resistor
R208	282299-103	Resistor
R209	282299-202	Resistor
R210	1-281851-200R0	Resistor
R211	1-281851-10002	Resistor
R212, 213	1-281851-10001	Resistor
R214	1-281851-16601	Resistor

ELECTRICAL PARTS LIST
2800 SERIES RECORDER – ALL MODELS
BOARD ASSEMBLY, DRIVE AMPLIFIER – 886220 (Continued)
FIGURE 8-7

SYMBOL NUMBER	PART NUMBER	DESCRIPTION
R215, 216	1-281851-10000	Resistor
R217, 218	1-281851-80000	Resistor
R219	1-281851-72001	Resistor
R220	1-281851-40000	Resistor
R221	1-281851-80001	Resistor
R222	1-281851-40001	Resistor
R223, 224	5-241111-622	Resistor
R225	5-241111-392	Resistor
R226, 227	1-281851-50001	Resistor
R228	1-281851-10002	Resistor
R229	1-281851-60001	Resistor
R230	1-281851-60000	Resistor
R231	282299-502	Resistor
R232	1-281851-500R0	Resistor
R233	1-281851-10003	Resistor
R234	1-281851-26501	Resistor
R235	5-241111-104	Resistor
R236	5-241111-203	Resistor
R237	5-241111-822	Resistor
R238	5-241111-102	Resistor
R239, 240	5-241111-202	Resistor
R241	5-241111-391	Resistor
R242	5-241111-102	Resistor
R243	5-286587-181	Resistor
R244	5-283654-220	Resistor
R245	5-286587-181	Resistor
R246	5-241111-102	Resistor
R247	1-281851-20001	Resistor
R248	1-281851-500R0	Resistor
R249, 250	1-281851-80000	Resistor
R251	5-241111-104	Resistor
R252, 253	5-241111-103	Resistor
R254	1-281851-16001	Resistor
R255	1-281851-50000	Resistor
R256	5-241111-101	Resistor
R257	1-281851-20001	Resistor
R258, 259	1-281851-10002	Resistor
R260	282299-103	Resistor
R261	1-281851-15301	Resistor
R262	5-241111-104	Resistor

ELECTRICAL PARTS LIST
2800 SERIES RECORDER – ALL MODELS
BOARD ASSEMBLY, DRIVE AMPLIFIER – 886220 (Continued)
FIGURE 8-7

SYMBOL NUMBER	PART NUMBER	DESCRIPTION
R263, 264	5-130340-2R0	Resistor
R265	5-241111-822	Resistor
U201-204	280863-3	Integrated Circuit, 741C
*U205	269941-2	Integrated Circuit, 1439P1
U206	280863-3	Integrated Circuit, 741C
U207	285461	Voltage Reg., MC 7815
U208	285778	Voltage Reg., MC 7915
U209, 210	Not Used	
U211	285589	Isolator, LED, 4N28
–––	686391	Heatsink (Rectangular black object, top of view)
–––	685187	Jack Assembly (Not shown. Mounted on heatsink)
		Consisting of:
J201	285315	Jack
J202	289045	Jack
**P201	114816-15	Plug
**P202	289046	Plug

**Shipped loose. See items 7 & 8, Fig. 8-3. P202 shipped per customer order only.
*Case shape is actually rectangular (626 Mini-Dip)

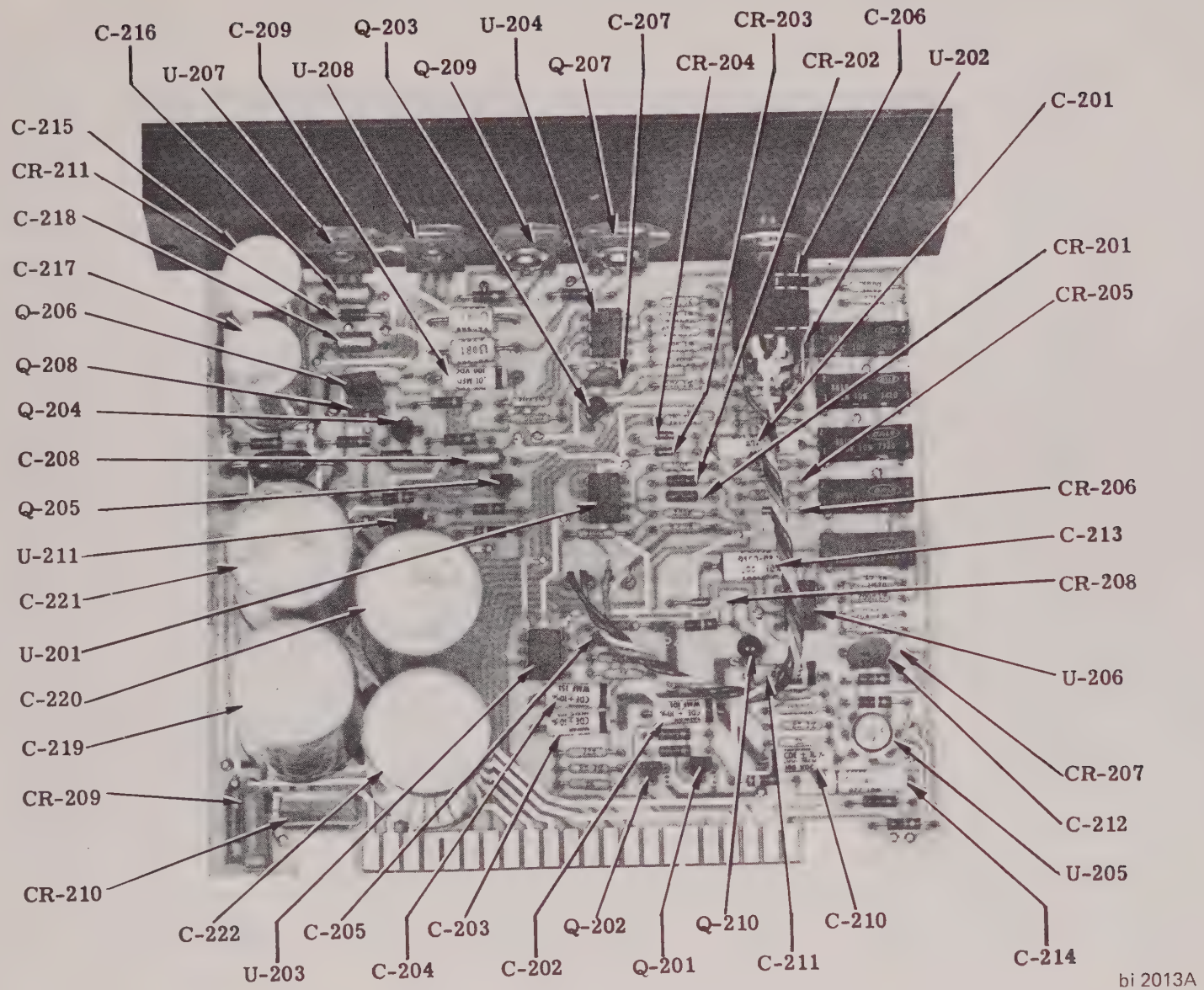


FIGURE 8-7 DRIVE AMPLIFIER ASSEMBLY (Sheet 1 of 2)

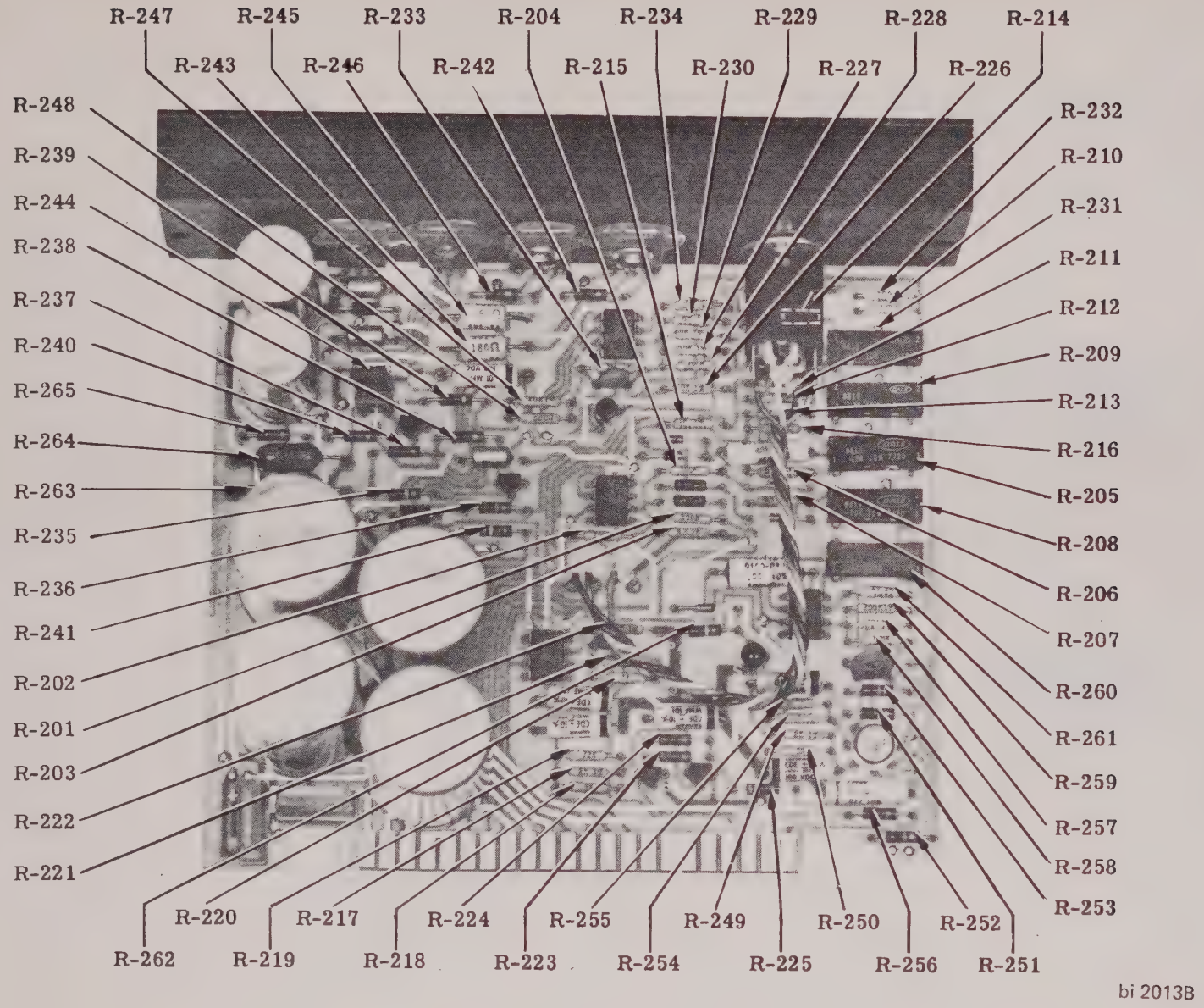


FIGURE 8-7 DRIVE AMPLIFIER ASSEMBLY (Sheet 2 of 2)

ELECTRICAL PARTS LIST
2800 SERIES RECORDER – ALL MODELS
BOARD ASSEMBLY
CONTROL-TIMER 886327
FIGURE 8-8

SYMBOL NUMBER	PART NUMBER	DESCRIPTION
C101, 102	243037-507	Capacitor
C103	262585-106	Capacitor
C104	240352-102	Capacitor
C105	262585-475	Capacitor
C106	230098-104	Capacitor
CR101	286018-2	Diode
CR102, 103	286018-1	Diode
CR104	Not Used	
CR105, CR106	269256-7	Semiconductor, Diode
CR123	280440	Diode, 1N4148
K101	289048-24	Relay
Q101, 102, 104	286141	Transistor
R101, 102	5-241111-302	Resistor
R103	5-241111-242	Resistor
R104, 105	5-241111-103	Resistor
R106	5-241111-271	Resistor
R107	5-241111-103	Resistor
R108	5-241111-302	Resistor
S103	268923	Switch
S104	286142-8	Switch (Mounted on heatsink)
U101	285317	Voltage Regulator
U102 thru U105	270622	Integrated Circuit, 7493
U106	286016	Integrated Circuit, 74121
U107	285589	Isolator, Led
———	285179	Switchplate (Mounted on heatsink)
———	686397	Heatsink (Rectangular black object; top of view)
Jumper	267235	Jumper Circuit

NOTE: See Table 8-1, Fuse Table for fuse ratings.

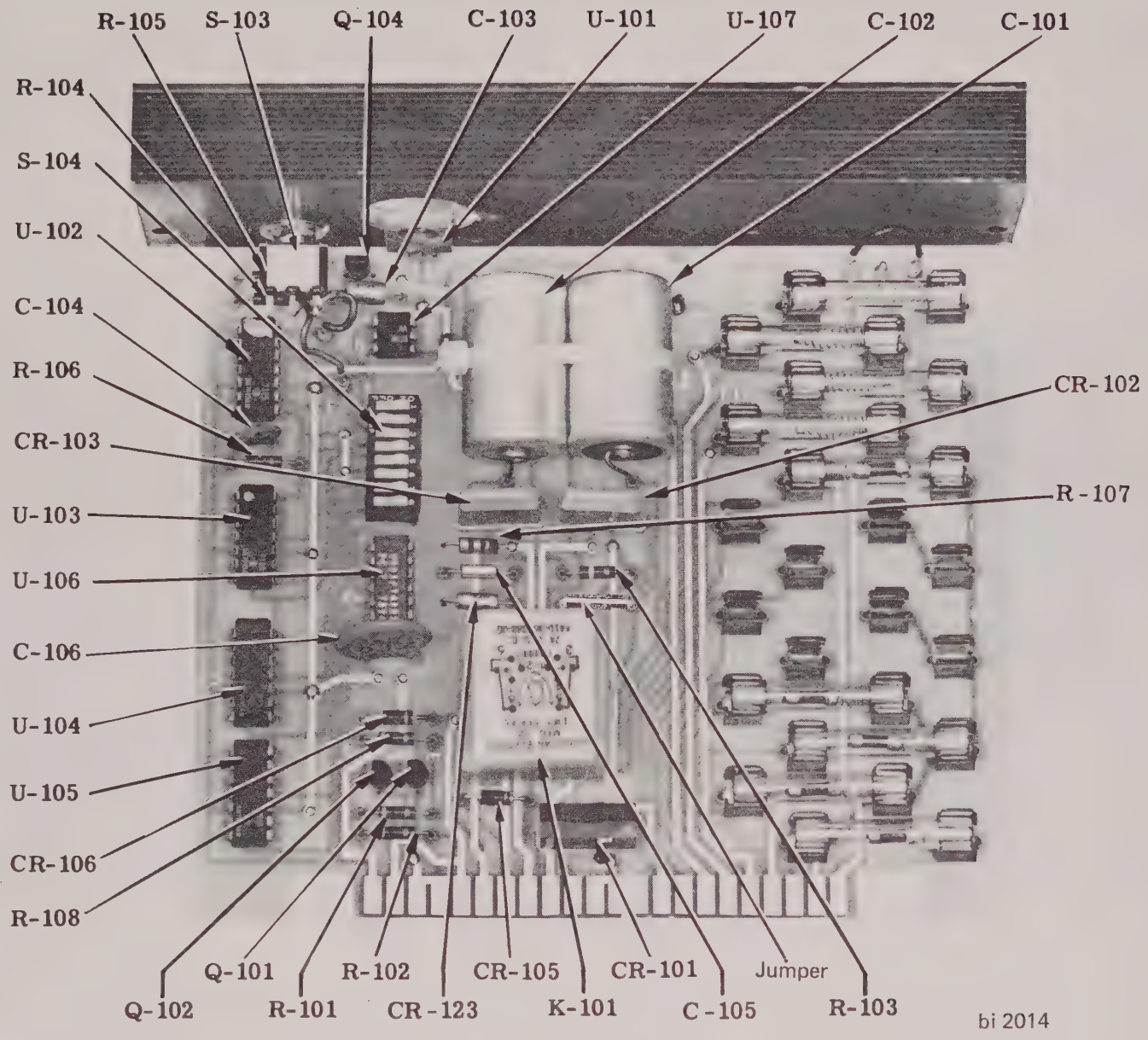


FIGURE 8-8 CONTROL TIMER BOARD ASSEMBLY

EXPLODED VIEW PARTS LIST
2800 SERIES RECORDER – ALL MODELS
CHASSIS ASSEMBLIES – 380mm MAINFRAME
FIGURE 8-9

ITEM NUMBER	PART NUMBER	DESCRIPTION	SYMBOL NUMBER
	**887707-1	Chassis Assembly, 115V/60Hz ÷ 100	
	**887707-2	Chassis Assembly, 115V/50Hz ÷ 100	
	**887707-3	Chassis Assembly, 230V/50Hz ÷ 100	
	**887707-4	Chassis Assembly, 115V/60Hz ÷ 60	
	**887707-5	Chassis Assembly, 115V/50Hz ÷ 60	
	**887707-6	Chassis Assembly, 230V/50Hz ÷ 60	
	**887707-7	Chassis Assembly, 115V/400Hz ÷ 60, ÷100	
**1	785129	Drive Assy, 115V/60Hz – 100 (See Fig. 8-10)	
	785129-1	Drive Assy, 115V/60Hz – 60 (See Fig. 8-10)	
	786837	Drive Assy, 115V/50Hz – 100 (See Fig. 8-10)	
	786837-1	Drive Assy, 115V/50Hz – 60 (See Fig. 8-10)	
	786886	Drive Assy, 230V/50Hz – 100 (See Fig. 8-10)	
	786886-1	Drive Assy, 230V/50Hz – 60 (See Fig. 8-10)	
2	265814-4	Board, Terminal	TB-104
3	286484	Bracket	
4	487125	Chassis, Bottom	
5	286026	Transformer, Power	T-101 thru T-108
6	286024	Transformer, Control	T-109

*115V/400Hz Chassis Assemblies (887707-7) do not include Drive Assemblies. Drive Assembly P/N for ÷ 100 model is 12-2202-16; for ÷ 60 model is 12-2203-16.

**Chassis Assemblies and Drive Assemblies are not procurable. For Chassis parts order from items 2 thru 6 on this page, and for drive assy parts refer to Figure 8-10 parts list.

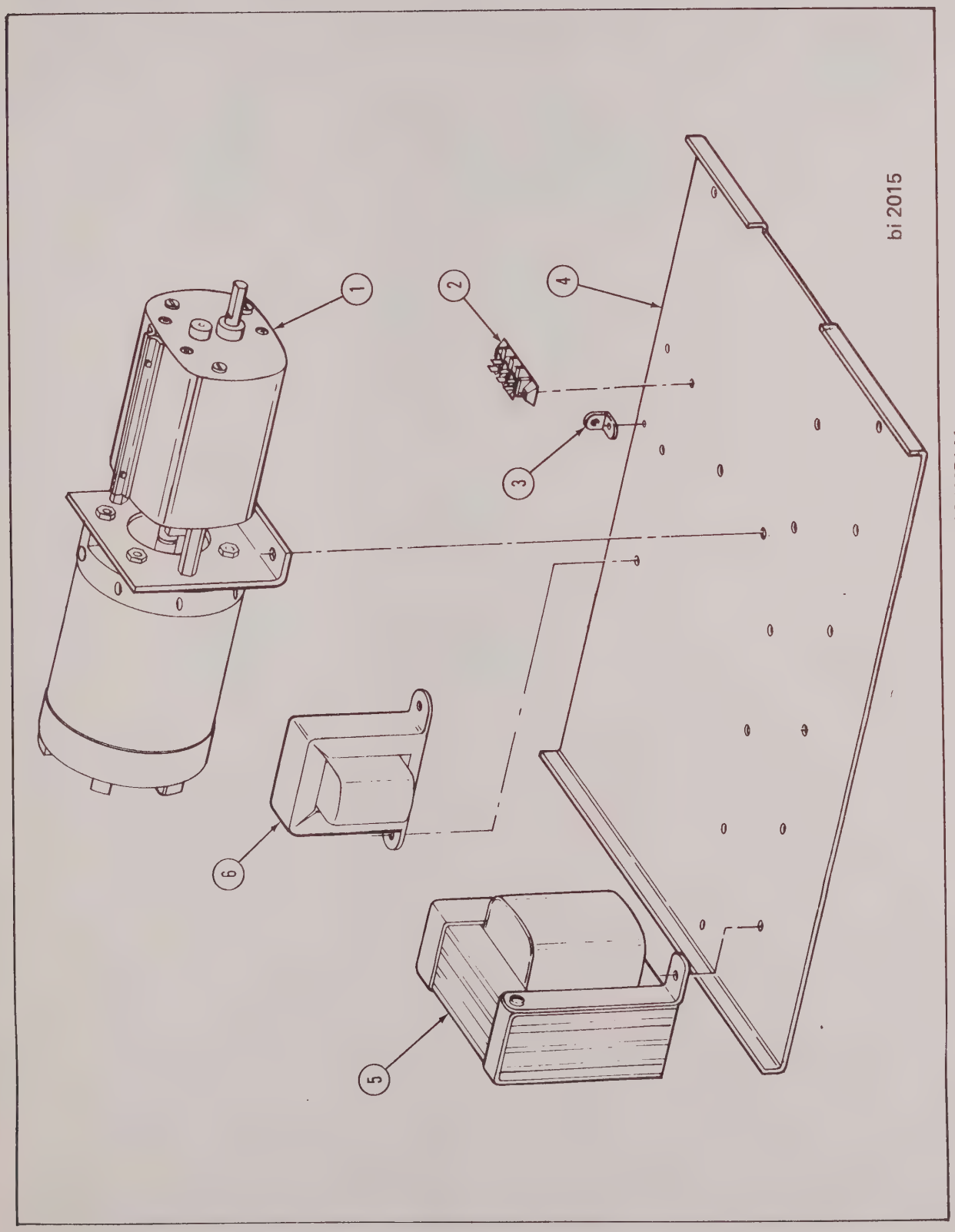


FIGURE 8-9 CHASSIS ASSEMBLY

EXPLODED VIEW PARTS LIST
2800 SERIES RECORDER – ALL MODELS
DRIVE ASSEMBLIES – 380 mm MAINFRAME
FIGURE 8-10

ITEM NUMBER	PART NUMBER	DESCRIPTION	SYMBOL NUMBER
	*785129	Drive Assembly 115V/60Hz ÷ 100	
	*785129-1	Drive Assembly 115V/60Hz ÷ 60	
	*786837	Drive Assembly 115V/50Hz ÷ 100	
	*786837-1	Drive Assembly 115V/50Hz ÷ 60	
	*786886	Drive Assembly 230V/50Hz ÷ 100	
	*786886-1	Drive Assembly 230V/50Hz ÷ 60	
1	12-2158-16	Transmission Assy – 16SPD (60Hz, ÷ 100 Models)	A-111
	12-2160-16	Transmission Assy – 16SPD (60Hz, ÷ 60 Models)	A-111
	12-2159-16	Transmission Assy – 16SPD (50Hz, ÷ 100 Models)	A-111
	12-2161-16	Transmission Assy – 16SPD (50Hz, ÷ 60 Models)	A-111
2	127913	Coupling, Universal	
3	127911	Post	
4	123695	Core, Coupling	
5	127912	Coupling, Universal	
6	385617	Bracket, Motor Mounting	
7	232997-23	Strap, Retaining	
8	265840-2	Terminal Lug	
9	387919	Motor, 115V/60Hz	B-101
	287170	Motor, 115V/50Hz	B-101
	267590	Motor, 230V/50Hz	B-101

*Drive Assemblies are not procurable. Order desired parts from itemized list on this page.

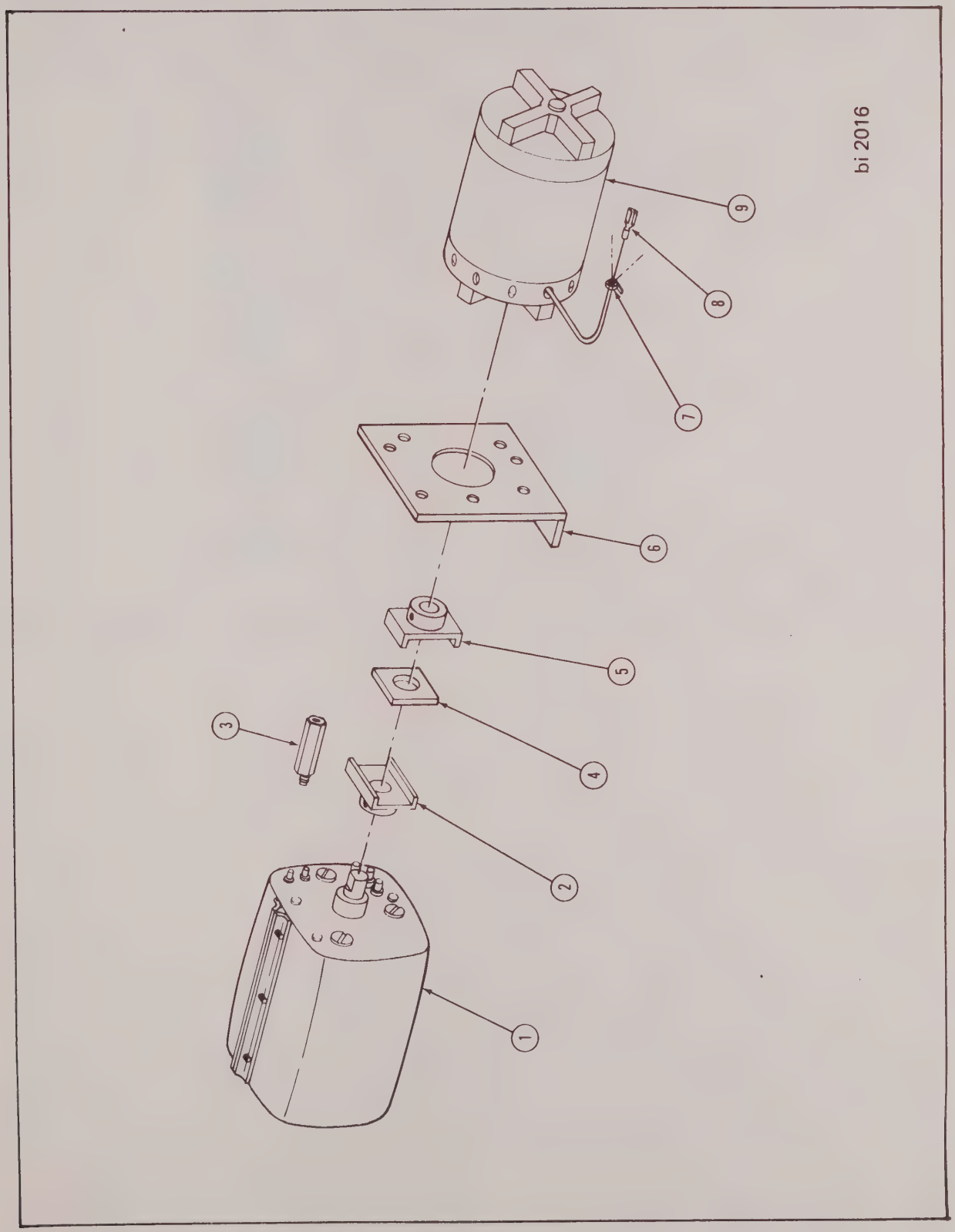


FIGURE 8-10 DRIVE ASSEMBLY

EXPLODED VIEW PARTS LIST
2800 SERIES RECORDER – All Models
PENMOTOR BAR ASSEMBLY
FIGURE 8-11

ITEM NUMBER	PART NUMBER	DESCRIPTION
	*887749	Penmotor Bar Assy
1	487708	Mounting Bar
	690565	Event Marker Assembly & Brkt
2	287704	Bracket, Event Marker
3	887715	Event Marker Assembly
4	887156	Penmotor Assy (Includes items 5 thru 14)
5	285273	Band Anchor
6	284925-2	Band Clamp
7	265424-09008	Screw, Fillester Head
8	785269	Drive Arm Assy
9	685270	Drive Band
10	31-121166-0003	Screw, Set (Pen Adjustment)
11	284993	Pen Pressure Bracket
12	285266-1	Spacer
13	285271	Transition Piece
14	285265	Front Band Clamp (A-P)
	31-119917-0005	Screws (Pen & Pen Pressure Brkt)
15	686536	Penmotor Support

*Penmotor Bar Assy not procurable. Order desired parts from itemized list on this page.

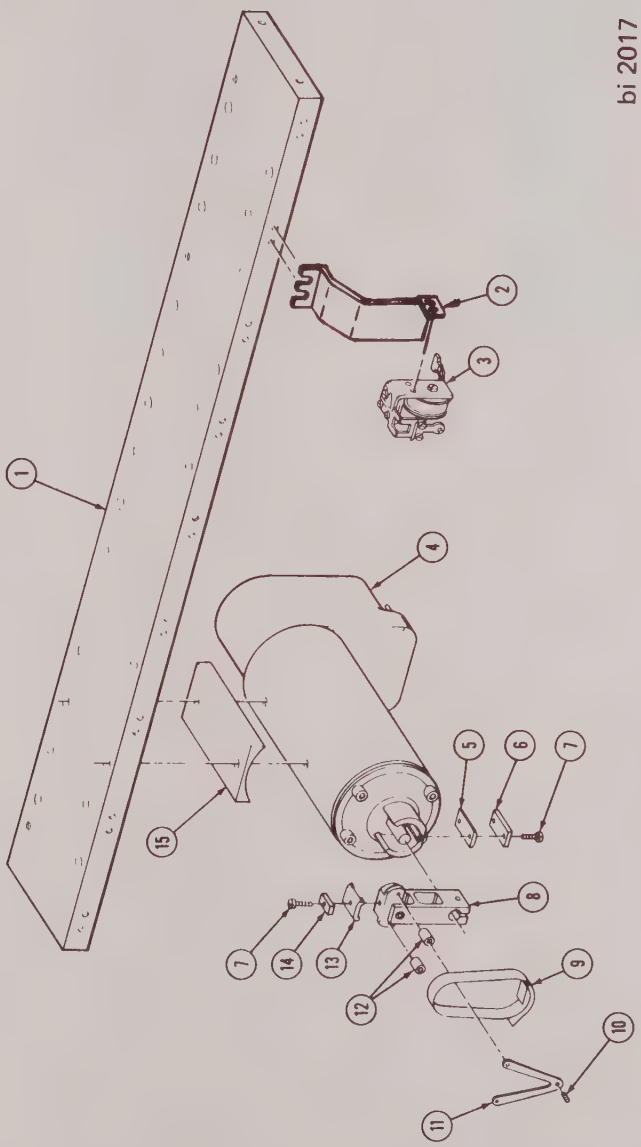


FIGURE 8-11 PENMOTOR BAR ASSEMBLY

EXPLODED VIEW PARTS LIST
2800 SERIES RECORDER – All Models
WRITING TABLE ASSEMBLY
FIGURE 8-12

ITEM NUMBER	PART NUMBER	DESCRIPTION
	887128-1	Table Assembly, Writing
*1	787117	Bar Assy, Writing
	787119	Bar Assy, Writing
	2-214148-102	Dowel Pin (2-Req'd)
2	787109	Paper Release Assy
3	343616-910	Support Assy, Right
4	4-112468-21	Roll Pin
5	1-210761-6	Bearing, Ball
6	387122	Roll, Pressure
7	787116-1	Bar Subassy, Pull
8	243867-1	Packing, Preformed
9	343617-910	Support Assy, Left
10	243855-1	Catch, Friction

*Item 1, P/N 787117, not procurable. Use indented parts.

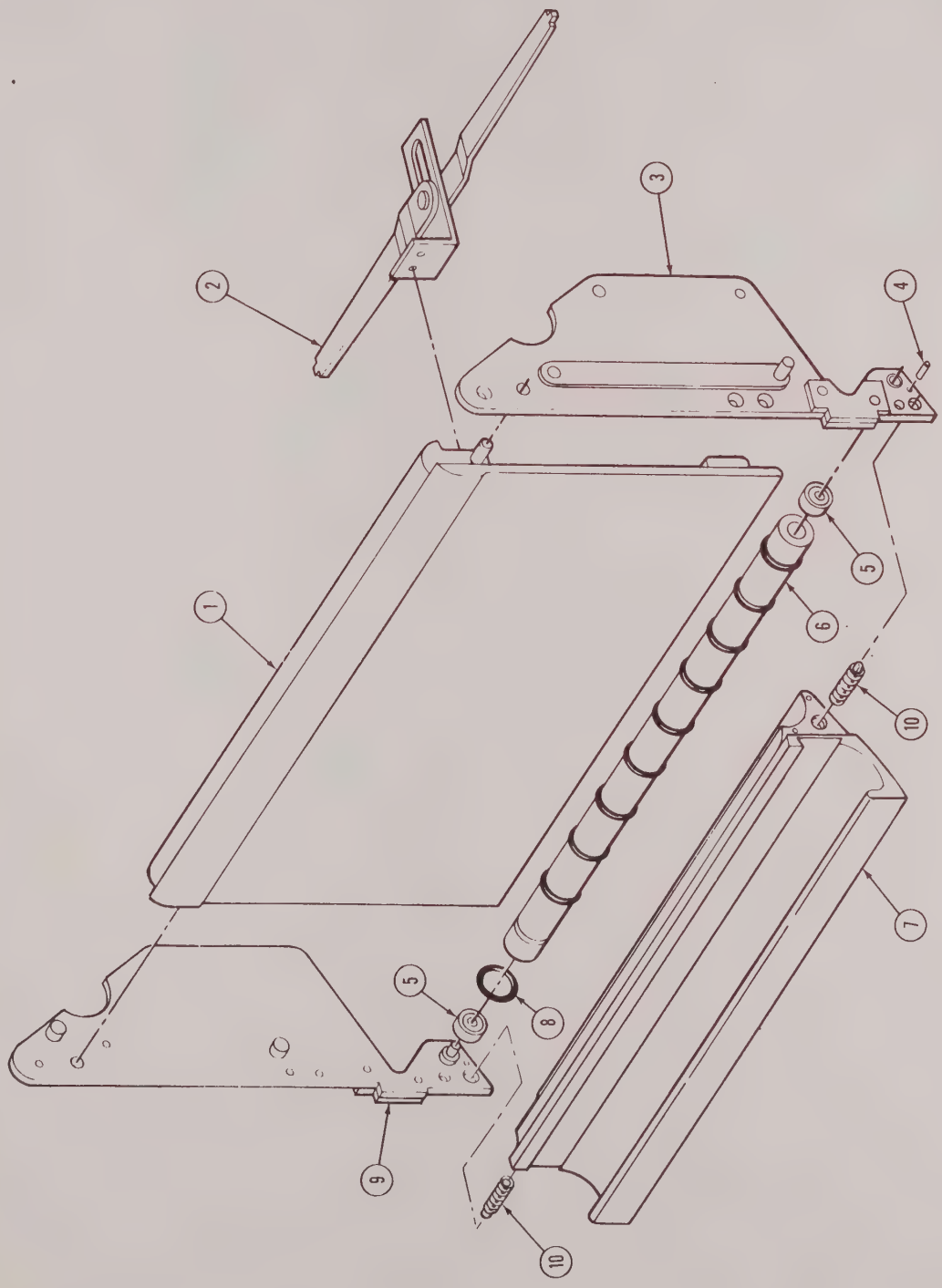


FIGURE 8-12 WRITING TABLE ASSEMBLY

EXPLODED VIEW PARTS LIST
2800 SERIES RECORDER – All Models
SENSOR ASSEMBLY
FIGURE 8-13

ITEM NUMBER	PART NUMBER	DESCRIPTION	SYMBOL NUMBER
	783590	Sensor Assembly	
1	286154	Switch, Sensitive	S-102
2	286386	Arm Switch	
3	743915-10	Arm Assy, Sensor	
4	286385	Spring, Torsion	
5	286384	Pin	

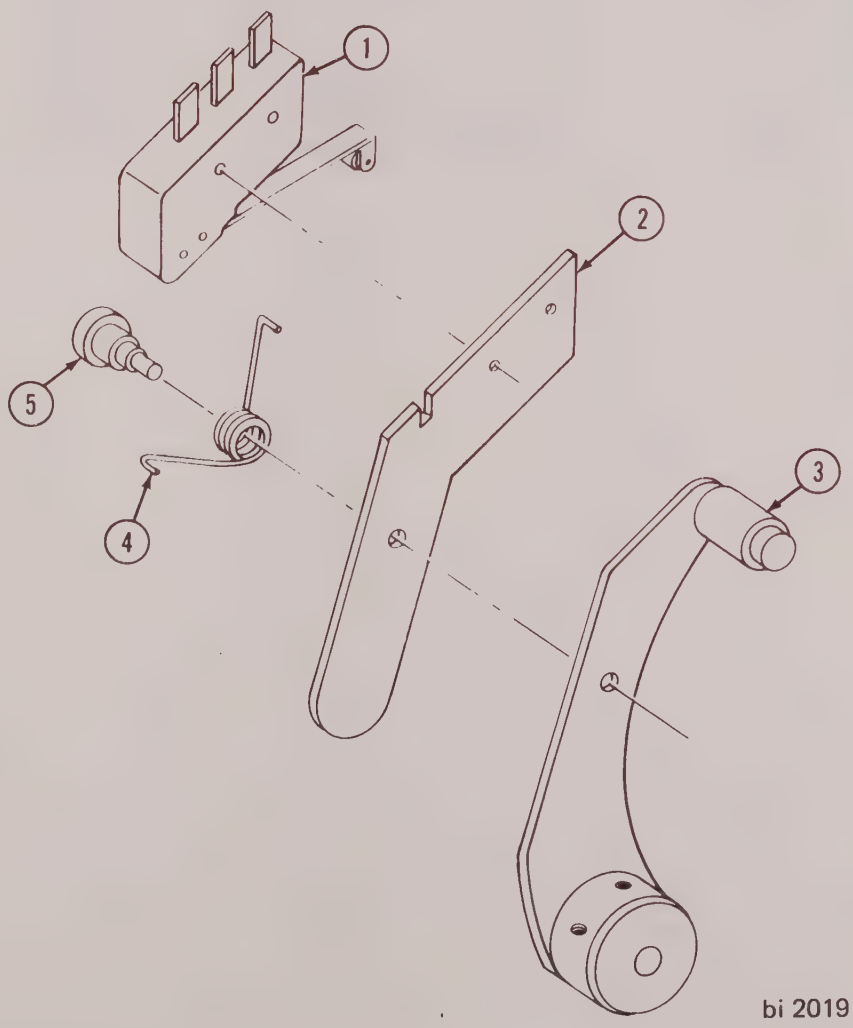


FIGURE 8-13 SENSOR ASSEMBLY

EXPLODED VIEW PARTS LIST
2800 SERIES RECORDER – All Models
BRACKET ASSEMBLY, SHIELD
FIGURE 8-14

ITEM NUMBER	PART NUMBER	DESCRIPTION	SYMBOL NUMBER	USED ON
	887129-1	Bracket Assy, Shield		60Hz Models
	887129-3	Bracket Assy, Shield		50Hz Models
	787234	Bracket Assy, Shield		400Hz Models
1	263394-1	Clamp, Capacitor		
2	1-263395-405	Capacitor, 4ufd	C-106	60Hz Models
	1-263395-505	Capacitor, 5ufd	C-106	50Hz Models
	1-263395-205	Capacitor, 2ufd	C-106	400Hz Models
3	2-128693-1	Grommet, Catapillar		
4	265814-3	Terminal Board	TB-105	400Hz Models
5	281852-563	Capacitor, .056ufd	C-107	400Hz Models
6	234623-16	Clamp		400Hz Models
7	387115	Bracket, Shield		50/60Hz Models
	387232	Bracket, Shield		400Hz Models
8	265814-12	Terminal Board (Quick Disc)	TB-103B	
9	265814-15	Terminal Board (Quick Disc)	TB-103A	

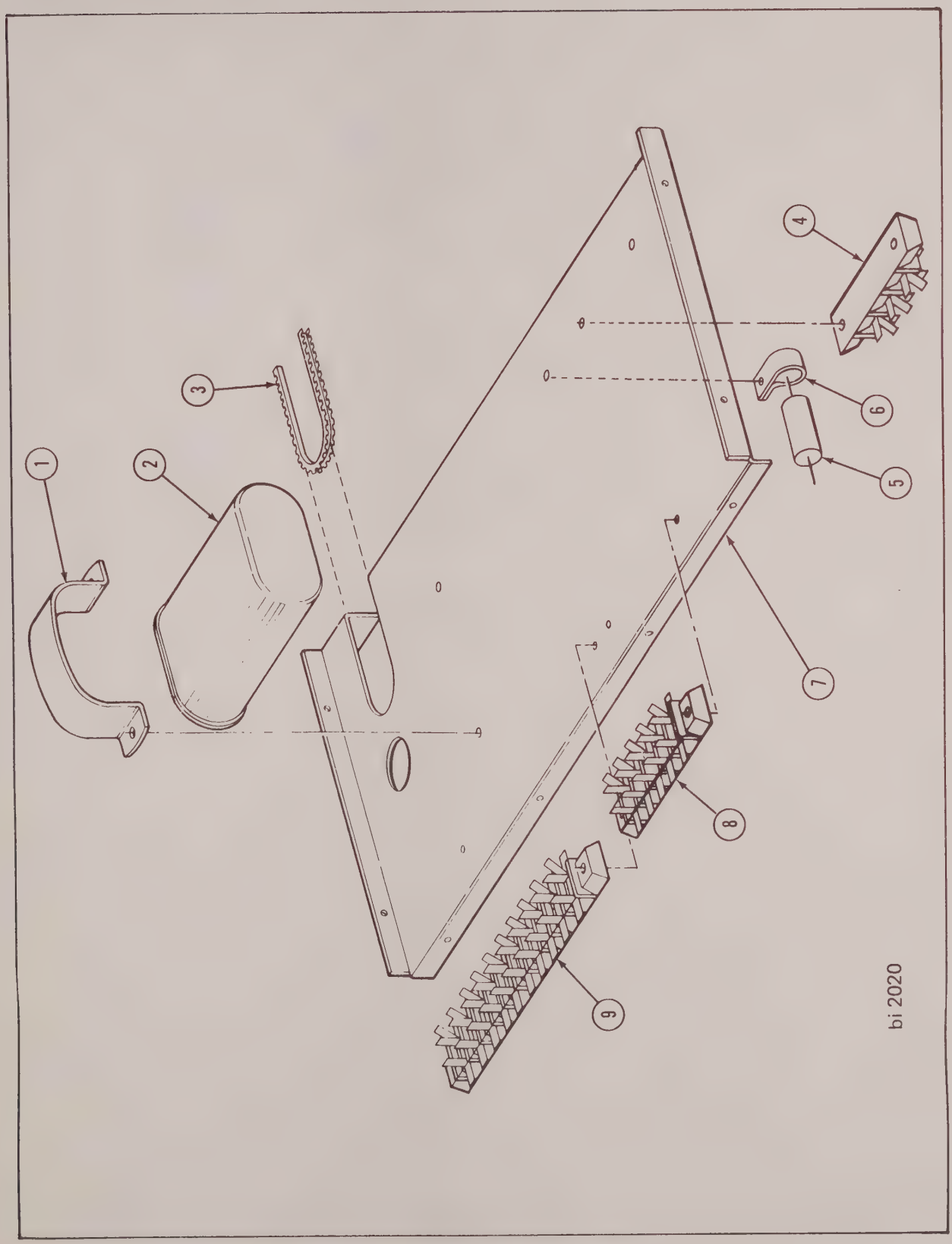


FIGURE 8-14 BRACKET ASSEMBLY, SHIELD

EXPLODED VIEW PARTS LIST
2800 SERIES RECORDER – ALL MODELS
RIGHT HAND PLATE ASSEMBLY
FIGURE 8-15

ITEM NUMBER	PART NUMBER	DESCRIPTION
	887760	Plate Assy, R.H.
1	285599	Catch
2	665789	Lever Assy, R.H.
3	243622	Pad, Friction
4	243623	Spring
5	1-265849-4	Bracket
6	385543-1	Guide
7	286130	Bracket, Conn.
8	127271	Washer
9	1-227070-9	Ring, Retaining
10	285712	Bracket, R.H.
	887755	Plate Subassy, R.H.
11	286186	Shaft
12	286184	Shaft
13	1-127657-5	Ring, Retaining
14	243507	Button, Detent
15	243898-62	Nut Assy

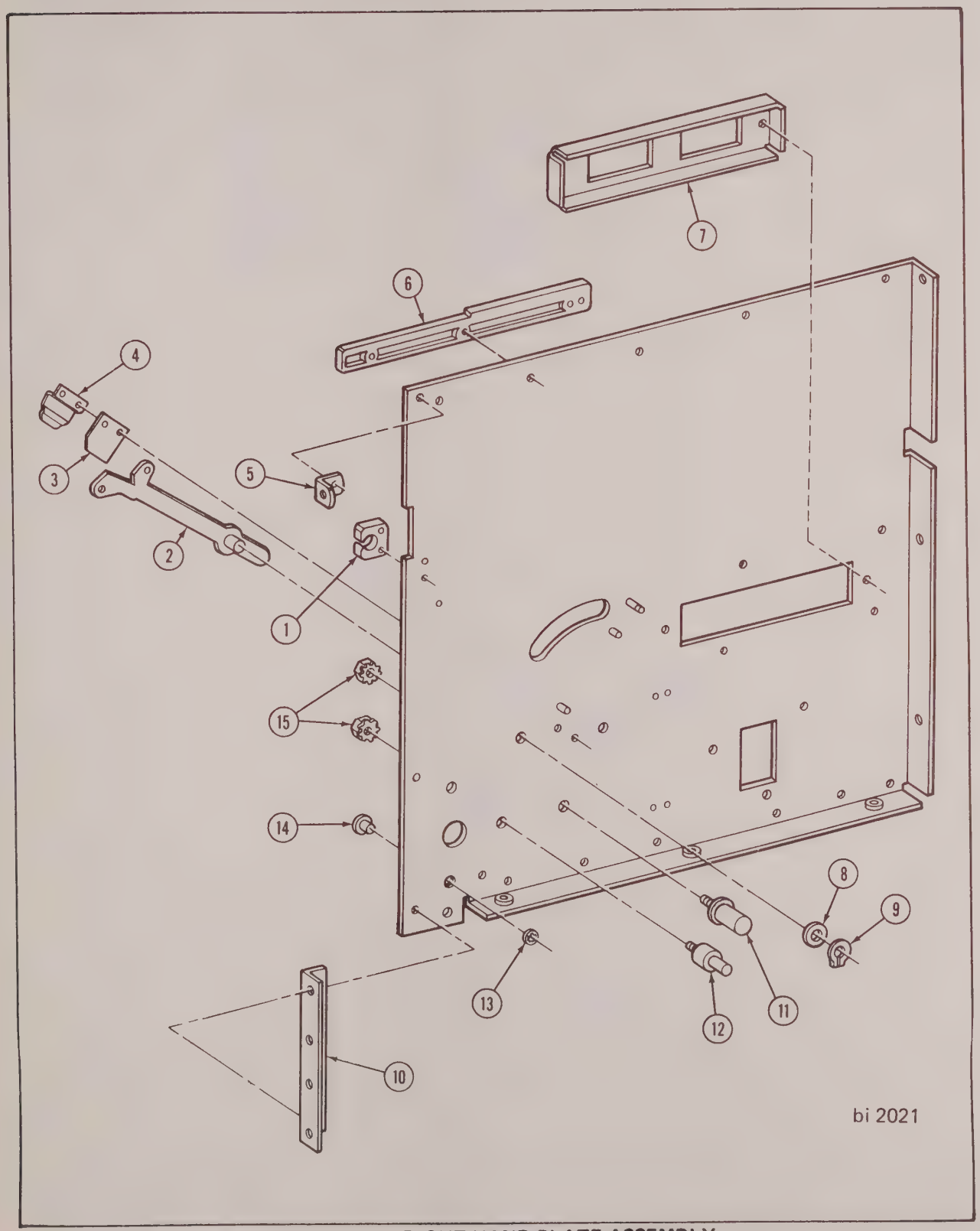
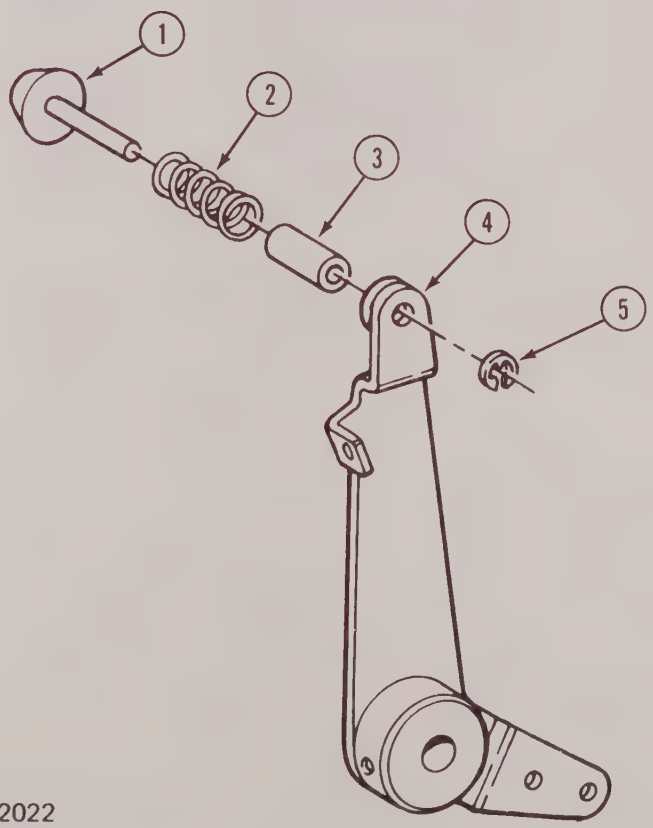


FIGURE 8-15 RIGHT HAND PLATE ASSEMBLY

EXPLODED VIEW PARTS LIST
2800 SERIES RECORDER – ALL MODELS
BRAKE ASSEMBLY
FIGURE 8-16

ITEM NUMBER	PART NUMBER	DESCRIPTION
	683485	Brake Assembly
1	685127	Disk Assy
2	269291	Spring
3	0-108400-15	Insulation, Flex Sleeve
4	743913-10	Arm Subassy
5	0-240731-2	Ring, Retaining



bi 2022

FIGURE 8-16 BRAKE ASSEMBLY

EXPLODED VIEW PARTS LIST
2800 SERIES RECORDER – All Portable Models
CASE ASSEMBLY
FIGURE 8-17

ITEM NUMBER	PART NUMBER	DESCRIPTION	USED ON
	887149	Case Assembly (w/o Preamps)	380-8
	887709	Case Assembly (w/8 Ch. Preamp Cage)	380-8P
1	486081	Panel	
2	785099-5	Handle Assy	380-8
	785099-9	Handle Assy	380-8P
3	686049-5	Cover, Center	380-8
	686049-9	Cover, Center	380-8P
4	286048	Support, Handle	
5	486075-2	Guide, Left	
6	486075-1	Guide, Right	
7	686051-5	Cover, Front & Rear	380-8
	686051-9	Cover, Front & Rear	380-8P
8	1-232736-16	Tape, Teflon	
9	267451-2	Mtg. Feet, Pair	
10	487141	Saddle, Recorder	380-8
	887710	Saddle, Recorder	380-8P
11	287185	Bar, Support	

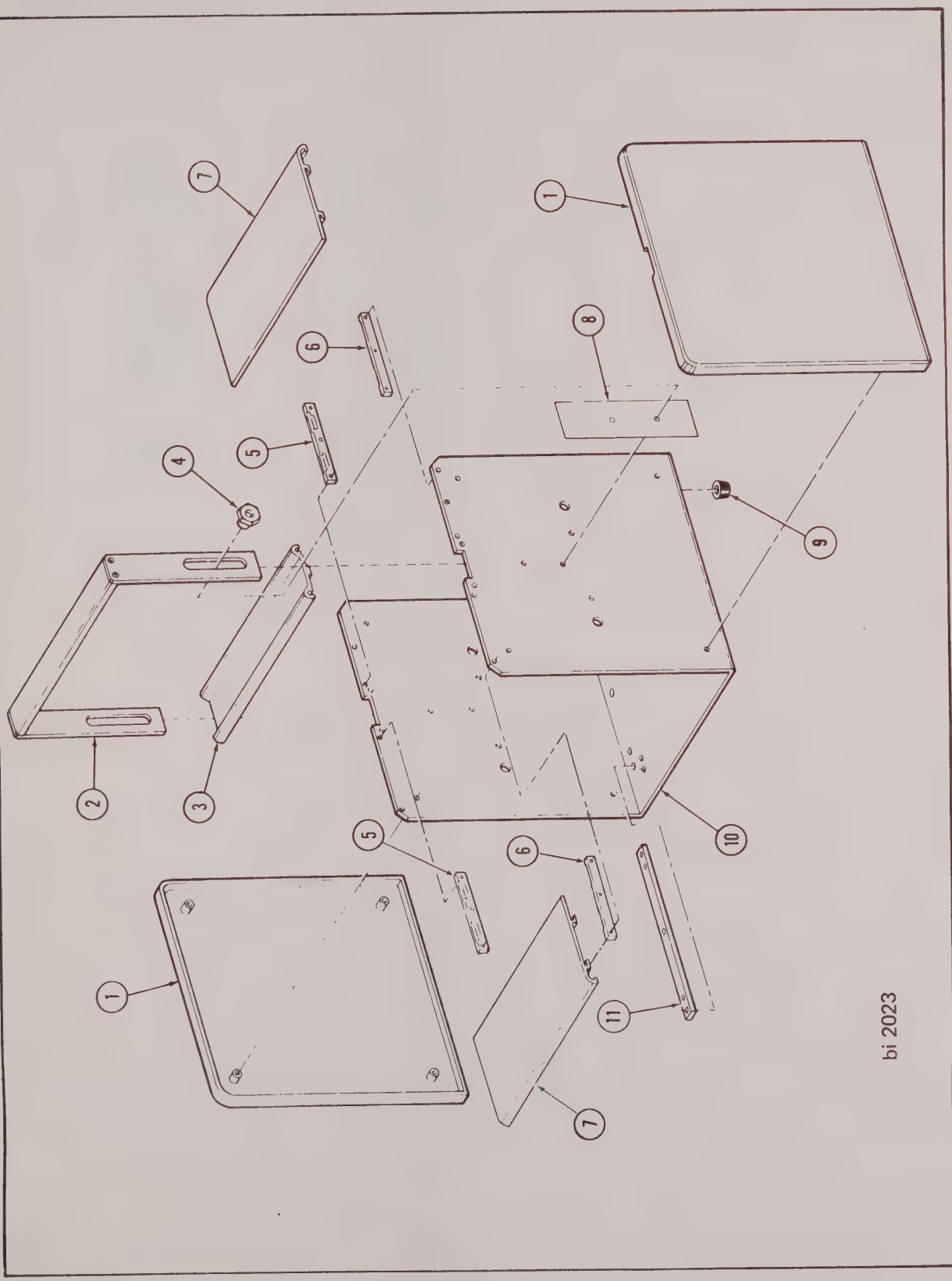
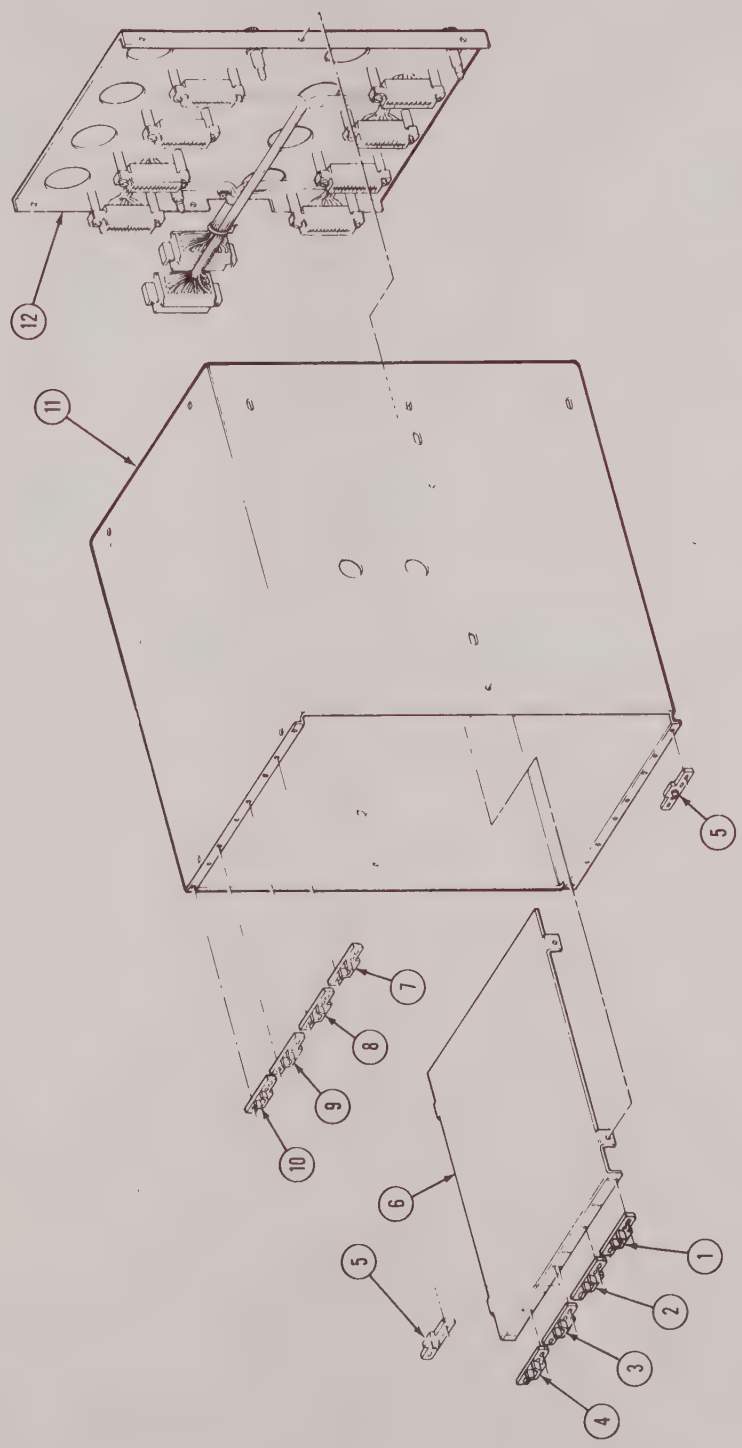


FIGURE 8-17 CASE ASSEMBLY

EXPLODED VIEW PARTS LIST
2800 SERIES RECORDER
PREAMP CAGE ASSEMBLY
FIGURE 8-18

ITEM NUMBER	PART NUMBER	DESCRIPTION
	887717	Cage Assy, Preamp
1	786056-8	Guide, Engraved – "8"
2	786056-6	Guide, Engraved – "6"
3	786056-4	Guide, Engraved – "4"
4	786056-2	Guide, Engraved – "2"
5	386058-2	Guide, Preamp
6	487718	Shelf
7	786056-7	Guide, Engraved – "7"
8	786056-5	Guide, Engraved – "5"
9	786056-3	Guide, Engraved – "3"
10	786056-1	Guide, Engraved – "1"
11	487711	Enclosure, Preamp
*12	887719	Cage Assy, Rear (See Fig. 8-19)

*Item 12 not procurable. Use Preamp Cage Assy or items from Fig. 8-19.



bi 2024

FIGURE 8-18 PREAMP CAGE ASSEMBLY

EXPLODED VIEW PARTS LIST
2800 SERIES RECORDER
PREAMP CAGE ASSEMBLY, REAR
FIGURE 8-19

ITEM NUMBER	PART NUMBER	DESCRIPTION	SYMBOL NUMBER
	*887719	Cage Assy, Rear	
1	270153-1	Contact, Elect	
2	0-270155-1	Connector	P204
3	286410-16	Connector	XA205 thru XA208
4	1-283408-2	Contact, Elect	
5	234623-10	Clamp	
6	270153-1	Contact, Elect	
7	0-270155-1	Connector	P203
8	286410-16	Connector	XA201 thru XA204
9	1-283408-2	Contact, Elect	
10	887720	Panel Assy, Rear	
11	286052	Screw, Shoulder	
12	0-240731-10	Ring, Retaining	

*Part Number 887719 not procurable. Use items 1 thru 12 on Parts List.

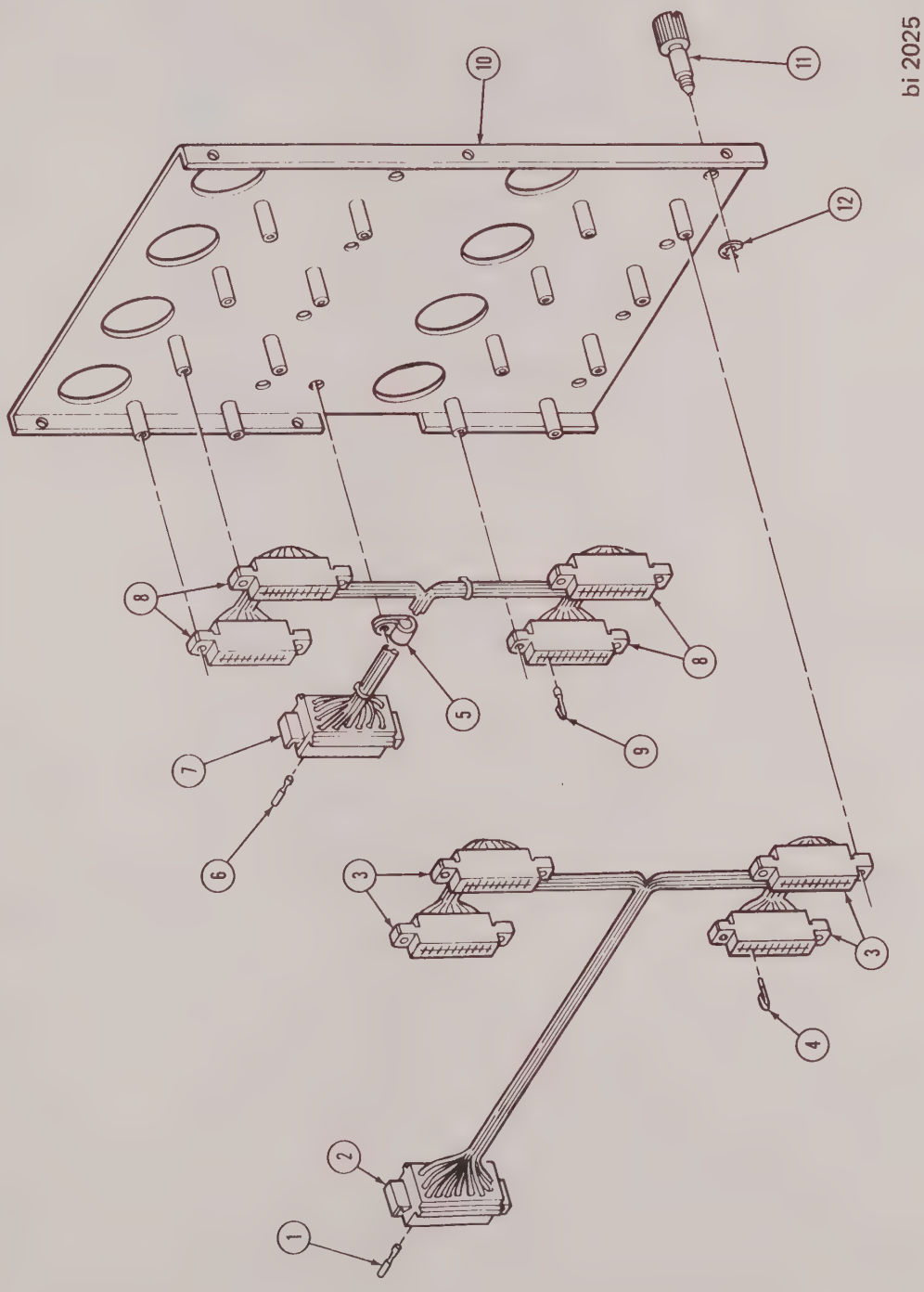


FIGURE 8-19 PREAMP CAGE ASSEMBLY, REAR

EXPLODED VIEW PARTS LIST
2800 SERIES RECORDER ACCESSORY – All Rack Mounted Models
RACK MOUNT INSTALLATION INSTRUCTIONS (688001)
FIGURE 8-20

ITEM NUMBER	PART NUMBER	DESCRIPTION
*1,2	2007-88XX-XX	2800 Series Recorder
3	887560	Saddle Assembly
4	287148	Nut Plate
5	787558	Panel Assembly
6	287583	Spacer
7	287610-4	Slide Pair
8	387642	Bracket
9	287660	Panel Filler
10	1-216741-425	Lockwasher
11	1-216741-430	Lockwasher
12	31-119918-0208	Screw
13	31-119918-8206	Screw
14	31-119920-0208	Screw
15	31-119998-82	Nut
16	243898-02	Nut
17	245244-02	Nut
18	248352-0218	Screw
19	262716-8206	Screw
20	11-1202-14	Kit Assembly, Rack Mtg. (includes items 3 thru 19, 21 & 22)
21	13-262716-8204	Screw
22	270903-12	Clamp

NOTE: Assembly instructions are included on Figure 8-20, page 8.46.

*2600 Series Recorder shown in view. Kit Assembly (item 20) is common to 2600 & 2800 Series Recorders.

7. ATTACH SHIPPING BRACKET ITEM 8 TO REAR RAILS USING ITEMS 11, 12, AND 17. ATACH BRACKET ITEM 8 TO SADDLE ITEM 3 USING ITEMS 19. (THIS WILL BE REMOVED IN NORMAL OPERATION).
6. ATTACH ITEMS 9 TO ITEMS 6 AND ITEMS 4 USING ITEMS 18. ADJUST ITEMS 9 FOR PROPER ALIGNMENT AND SPACING.
5. MOUNT RECORDER ASS'Y. ITEM 1 OR 2 ONTO SADDLE ASS'Y. ITEM 3 USING ITEMS 11 & 12. SLIDE RECORDER IN AND ALIGN PANELS OF RECORDER TO ITEM 5.
4. ATTACH ITEM 3 TO BRACKET ON ITEM 7 USING ITEMS 19. SLIDE SADDLE ASS'Y. IN SO THAT PANEL ITEM 5 IS AGAINST SPACER ITEM 6, THEN TIGHTEN ITEMS 19.
3. MOUNT ITEM 5 TO ITEM 3 USING ITEMS 16.
2. MOUNT SLIDES ITEMS 7, SPACERS ITEMS 6 TO FRONT RAIL AND NUT PLATES ITEMS 4 TO FRONT AND REAR RAILS. USE ITEMS 14 TO ATTACH TO FRONT RAILS AND ITEMS 11 & 12 TO ATTACH TO REAR RAILS. (ADJUST LENGTH OF SLIDE TO PROPER FIT AND TIGHTEN ITEM 12).
1. ASSEMBLE BRACKETS AND SLIDES (BOTH PART OF ITEM-7) USING ITEM 10, 13 & 15 FRONT AND REAR.

NOTES:

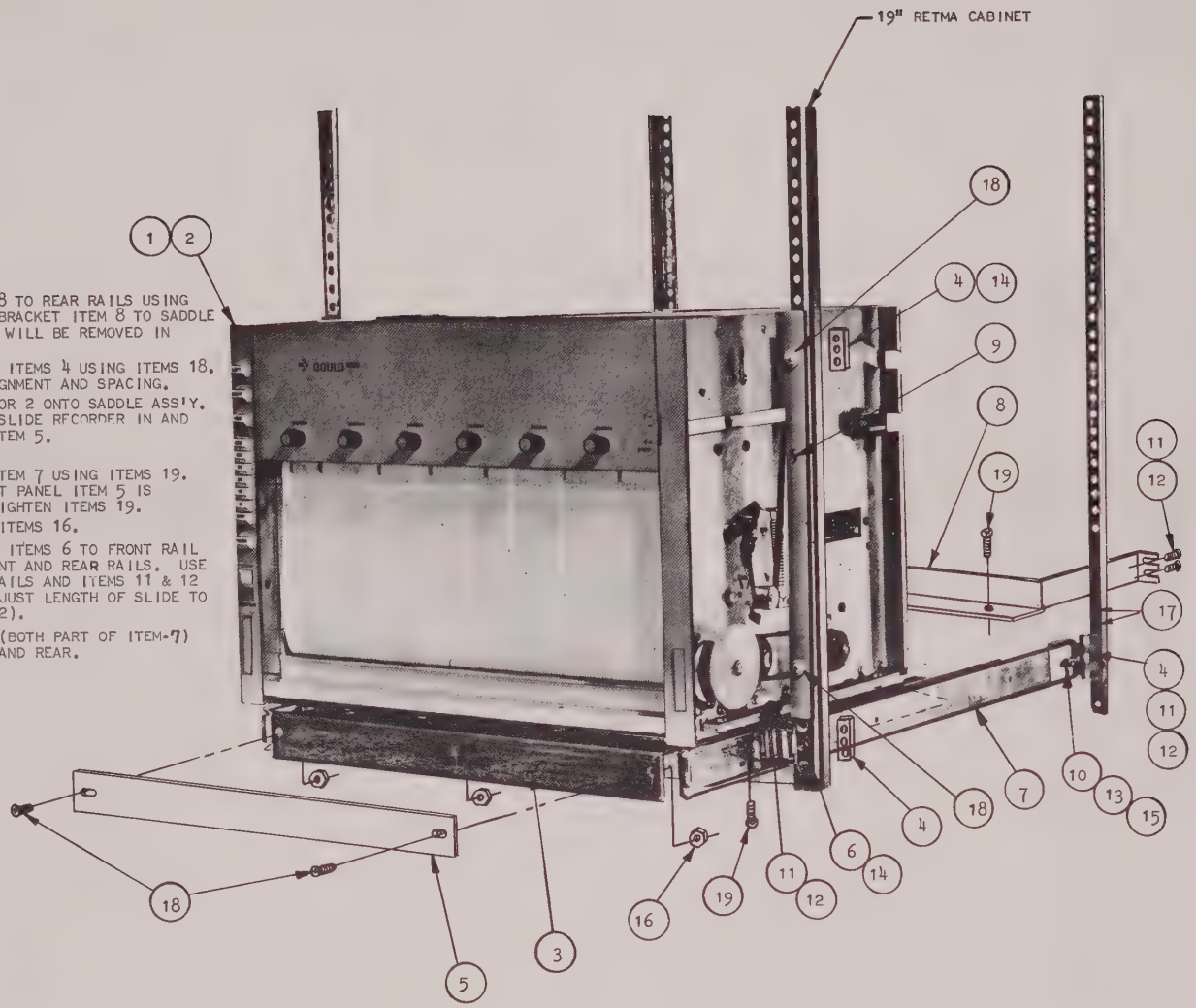


FIGURE 8-20 RACK MOUNT INSTALLATION INSTRUCTIONS

EXPLODED VIEW PARTS LIST
2800 SERIES RECORDER ACCESSORY – All Rack Mounted Models
PREAMP CAGE INSTALLATION INSTRUCTIONS (687319)
FIGURE 8-21

ITEM NUMBER	PART NUMBER	DESCRIPTION
*1	11-1202-15	Kit Assembly, Preamp Cage
2	269625	Nut Plate
3	1-216741-425	Lockwasher
4	31-119998-82	Nut
5	31-119918-8206	Screw
6	487540	Bracket, Mtg. - Rear
7	1-216741-430	Lockwasher
8	31-119918-0208	Screw
9	287541	Bar, Spacer
10	31-119998-02	Nut
11	487538	Bracket, Mtg. – Front
12	787542	Panel Assembly
13	687539	Panel Assembly
14	248352-0218	Screw
15	31-119920-0208	Screw

NOTE: Assembly instructions are included on Figure 8-21, page 8.48.

*Kit includes items 1 thru 15.

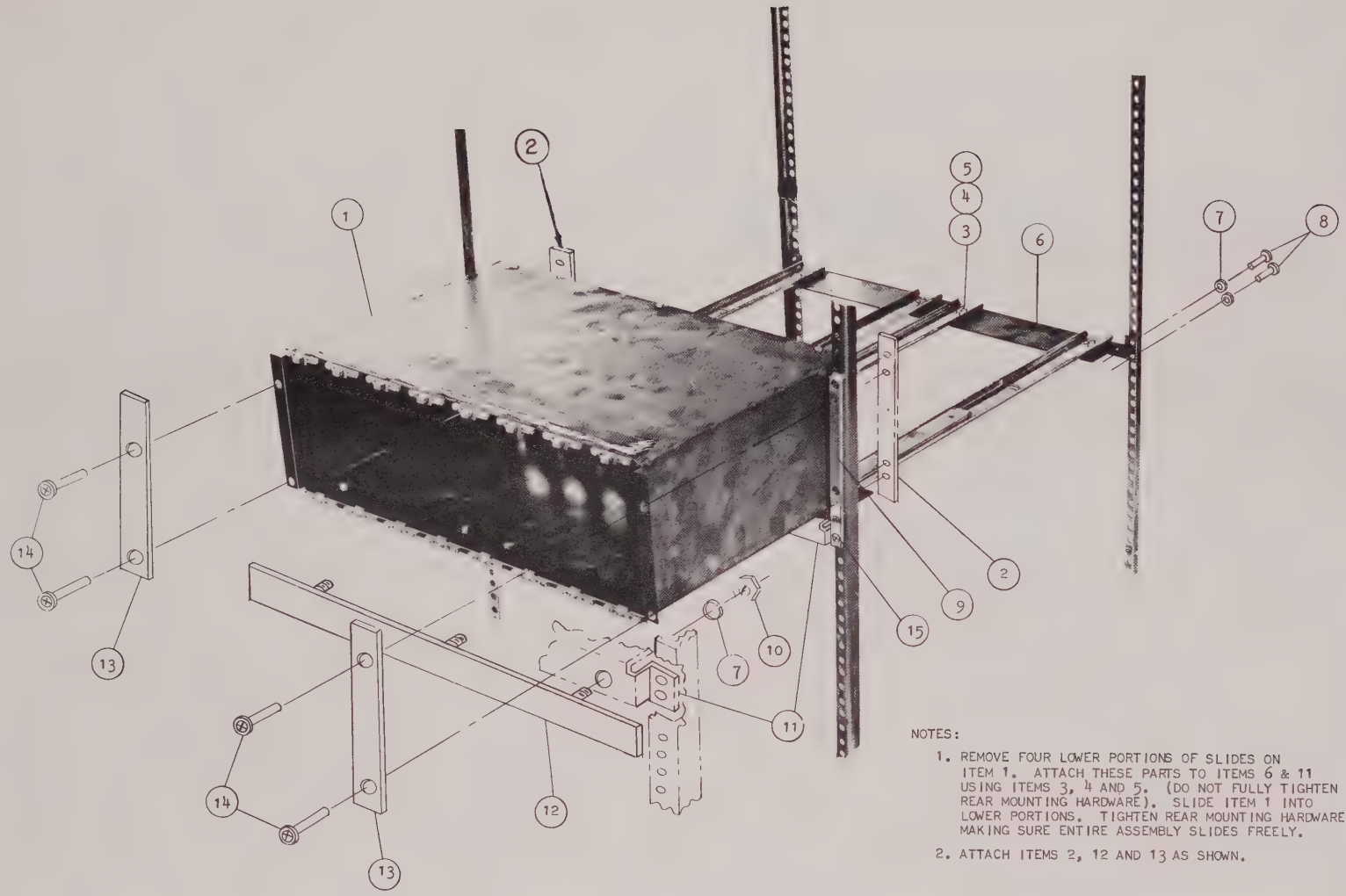

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
NOTES:
1. REMOVE FOUR LOWER PORTIONS OF SLIDES ON ITEM 1. ATTACH THESE PARTS TO ITEMS 6 & 11 USING ITEMS 3, 4 AND 5. (DO NOT FULLY TIGHTEN REAR MOUNTING HARDWARE). SLIDE ITEM 1 INTO LOWER PORTIONS. TIGHTEN REAR MOUNTING HARDWARE MAKING SURE ENTIRE ASSEMBLY SLIDES FREELY.
2. ATTACH ITEMS 2, 12 AND 13 AS SHOWN.

FIGURE 8-21 PREAMP CAGE INSTALLATION INSTRUCTIONS

EXPLODED VIEW PARTS LIST
2800 SERIES RECORDER – All Models
CHART TAKEUP ASSEMBLY 11-6402-12
FIGURE 8-22

ITEM NUMBER	PART NUMBER	DESCRIPTION
1	249617-4	Plate Cover – R.H.
2	243867-12	"O" Ring
3	246651	Roller, Guide
4	246307	Block
5	236865-3	Cotter Pin
6	266046	Pulley
7	767254-5	Arm Assembly, L.H.
8	9-249640-8206	Screw Fl. Hd.
9	687339	Shaft Assembly
10	247523-116	Plate, Ident. Mod. No.
11	767249-5	Arm, Right
12	249618-4	Plate Cover – L.H.
13	267253	Spring Compression
14	266184	Shaft, Shouldered
15	667251	Shaft Assembly, Shouldered
16	243696	Retainer, Bearing
17	267257	Pulley

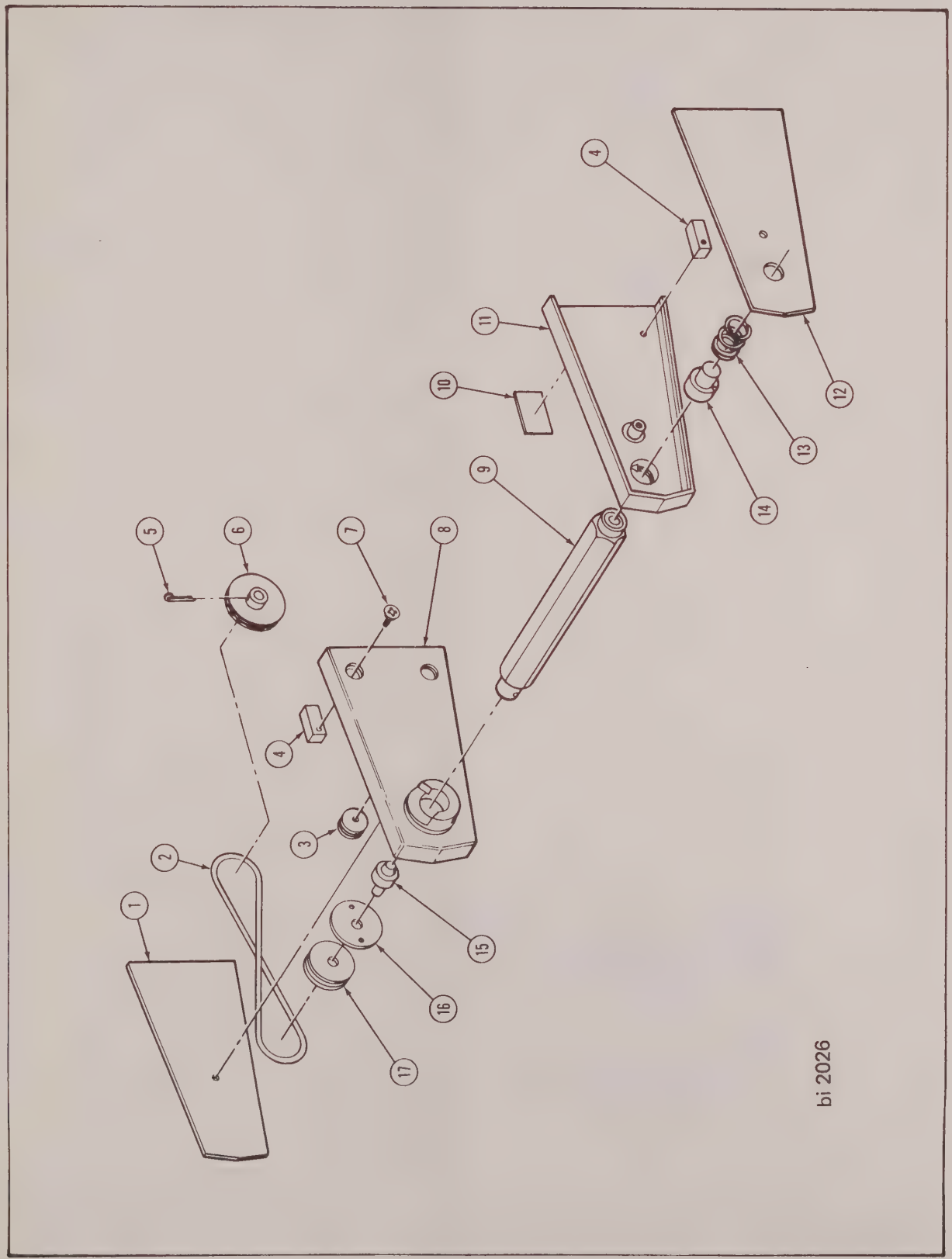
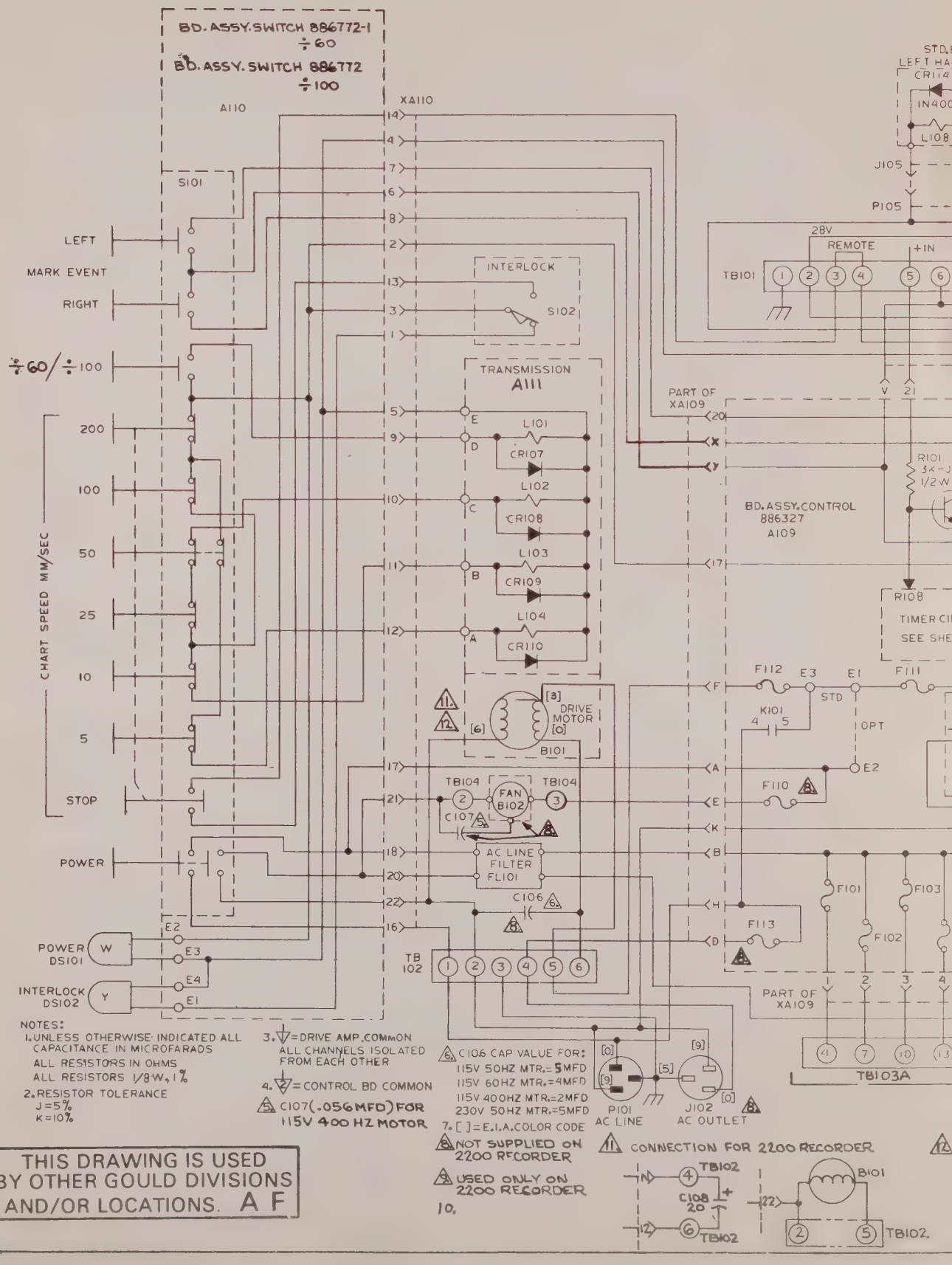


FIGURE 8-22 CHART TAKEUP ASSEMBLY



NOTES:

1. UNLESS OTHERWISE INDICATED ALL CAPACITANCE IN MICROFARADS
   ALL RESISTORS IN OHMS
   ALL RESISTORS 1/8W, 1%
2. RESISTOR TOLERANCE
   J=5%
   K=10%
3. ▽ = DRIVE AMP COMMON ALL CHANNELS ISOLATED FROM EACH OTHER
4. ▽ = CONTROL BD COMMON
5. C107 (.056 MFD) FOR 115V 400 HZ MOTOR
6. C106 CAP VALUE FOR:
   115V 50HZ MTR.=5MFD
   115V 60HZ MTR.=4MFD
   115V 400HZ MTR.=2MFD
   230V 50HZ MTR.=5MFD
7. [ ] = E.I.A. COLOR CODE
8. NOT SUPPLIED ON 2200 RECORDER
9. USED ONLY ON 2200 RECORDER
10.
11.
12.

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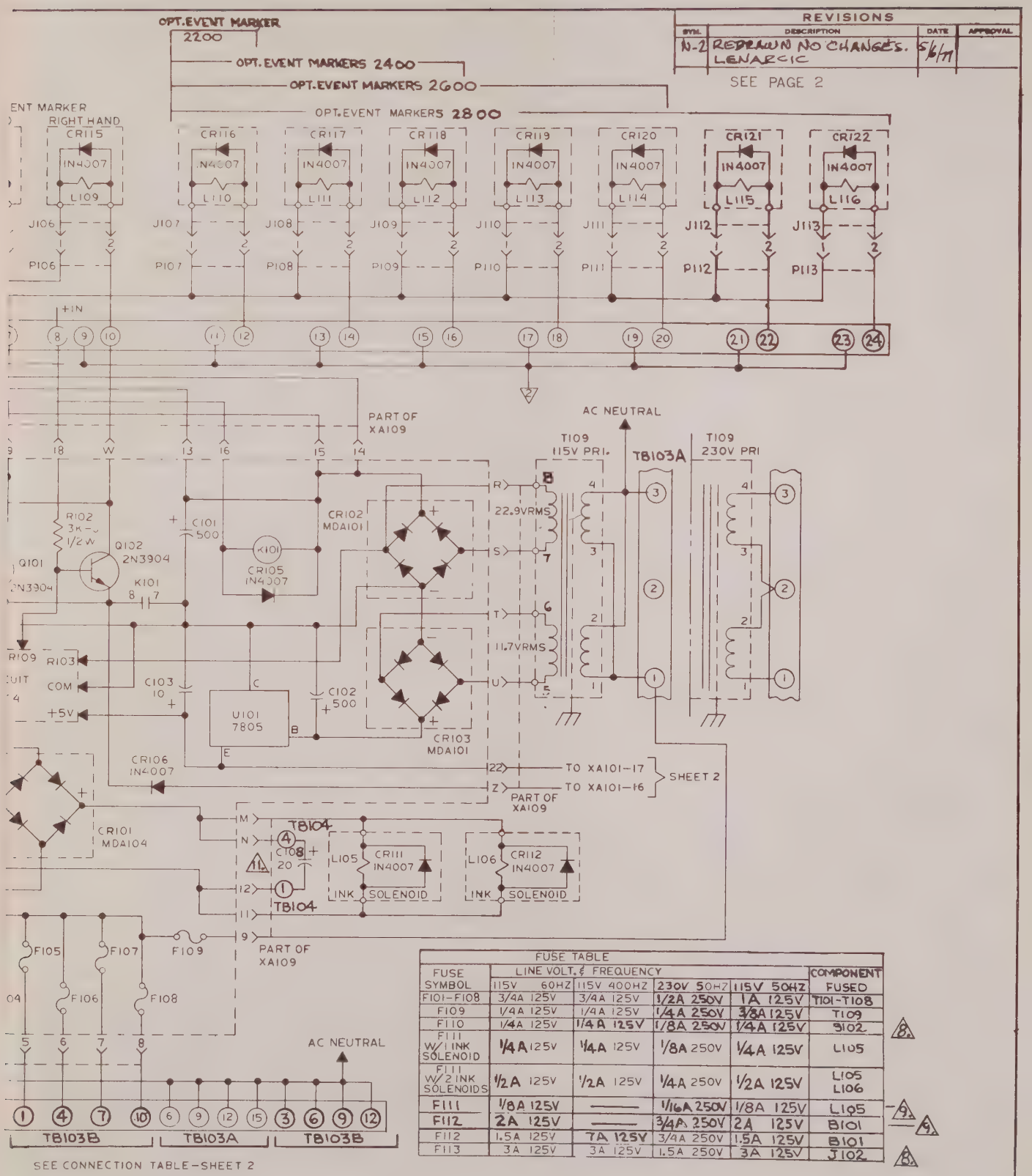
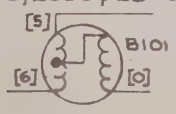


REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL
N-2	REDRAWN NO CHANGES. LENARCIC	5/6/77	

SEE PAGE 2

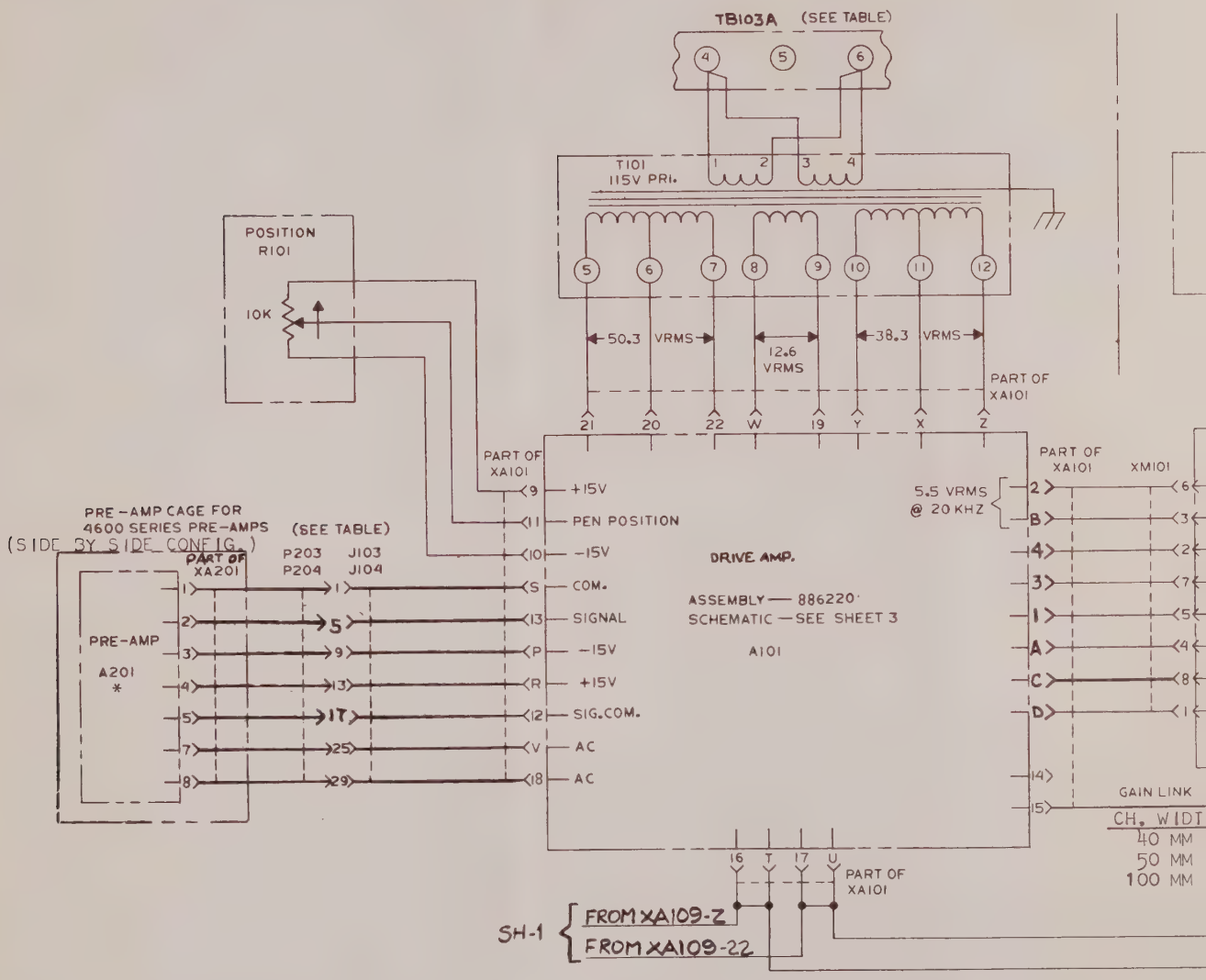
FUSE TABLE					
FUSE SYMBOL	LINE VOLT. & FREQUENCY				COMPONENT FUSED
	115V 60HZ	115V 400HZ	230V 50HZ	115V 50HZ	
F101-F108	3/4A 125V	3/4A 125V	1/2A 250V	1A 125V	T101-T108
F109	1/4A 125V	1/4A 125V	1/4A 250V	3/8A 125V	T109
F110	1/4A 125V	1/4A 125V	1/8A 250V	1/4A 125V	9102
F111 W/1 INK SOLENOID	1/4A 125V	1/4A 125V	1/8A 250V	1/4A 125V	L105
F111 W/2 INK SOLENOIDS	1/2A 125V	1/2A 125V	1/4A 250V	1/2A 125V	L105 L106
F111	1/8A 125V	——	1/16A 250V	1/8A 125V	L105
F112	2A 125V	——	3/4A 250V	2A 125V	B101
F112	1.5A 125V	7A 125V	3/4A 250V	1.5A 125V	B101
F113	3A 125V	3A 125V	1.5A 250V	3A 125V	J102

CONN. FOR 230V 50 HZ MTR. ON 2400, 2600 & 2800 RECORDER



RECORDER ASS'Y.

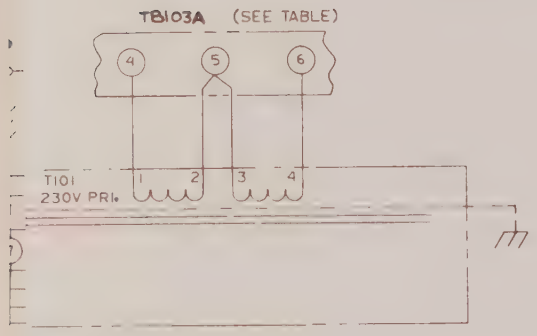
BY	DATE	NAME	Gould Inc. Instrument Systems Division Cleveland, Ohio 44114 U.S.A.
DR D. CZECH	9-10-74	SCHEMATIC 2000 SERIES	
CH	9/12/74	CODE IDENT. 96795	DWG. NO. 28585
APP	9/12/74	ISSUE CODE G	PG. 1 OF 4



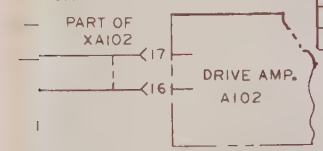
CHANNEL 1 SHOWN (TYP. 2 THRU 8 CHANNELS)

* FOR 6 & 8 CH. RECORDER RACK MOUNTED CONFIGURATION, SEE WIRING DIAGRAM 292226 (11-1202-15) FOR PREAMP TO DR. AMP. WIRING.

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL
P-1	ADDED WIRING TO COMPONENT SIDE OF 4600 PRE-AMP. TO 10 TERM. BARRIER STRIP DCN 23090	9/22/77	BAILEY
Q-1	DELETED DIODE CR104 IN4007 DCN 23151	9/23/77	BAILEY
R-1	DELETED WIRE 5 (DRIVE MOTOR B101) DCN 23188	9/23/77	BAILEY
S-1	REVISED PER DCN 24046 D. BAILEY	8/1/78	WK
T-1	REVISED PER DCN 24330		
U-1	REVISED PER DCN 24678 D. BAILEY	9/21/78	WK
V-1	REVISED PER DCN 24977/HAMILTON	8/8/79	
W-1	REV. GAIN LINK DCN 24726 D. BAILEY	11/2/79	



LINK REQ'D
RES.ASSY.692370,R301
SHORTING LINK
NONE REQ'D



(JUMPERING REPEATED FOR CHANNELS 2 THRU 8)

CHANNEL 1 THRU 8 CONNECTION TABLE FOR 2400, 2600 & 2800 RECORDER											
CHANNEL	TB103A TERM. USED			P203/J103 TERM. USED							
1	4	5	6	1	5	9	13	17	25	29	
2	7	8	9	2	6	10	14	18	26	30	
3	10	11	12	3	7	11	15	19	27	31	
4	3	14	15	4	8	12	16	20	28	32	
	TB103B TERM. USED			P204/J104 TERM USED							
5	1	2	3	1	5	9	13	17	25	29	
6	4	5	6	2	6	10	14	18	26	30	
7	7	8	9	3	7	11	15	19	27	31	
8	10	11	12	4	8	12	16	20	28	32	

CHANNEL 1 AND 2 CONNECTION TABLE FOR 2200 RECORDER										
CHANNEL	TB103A TERM. USED			P203/J103 TERM. USED						
1	4	5	6	1	4	7	10	13	11	14
2	7	8	9	3	6	9	12	15	2	5

RECORDER ASS'Y.

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BY	DATE
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CH Lenarcic	9/12/74
APP McNeill	9/12/74

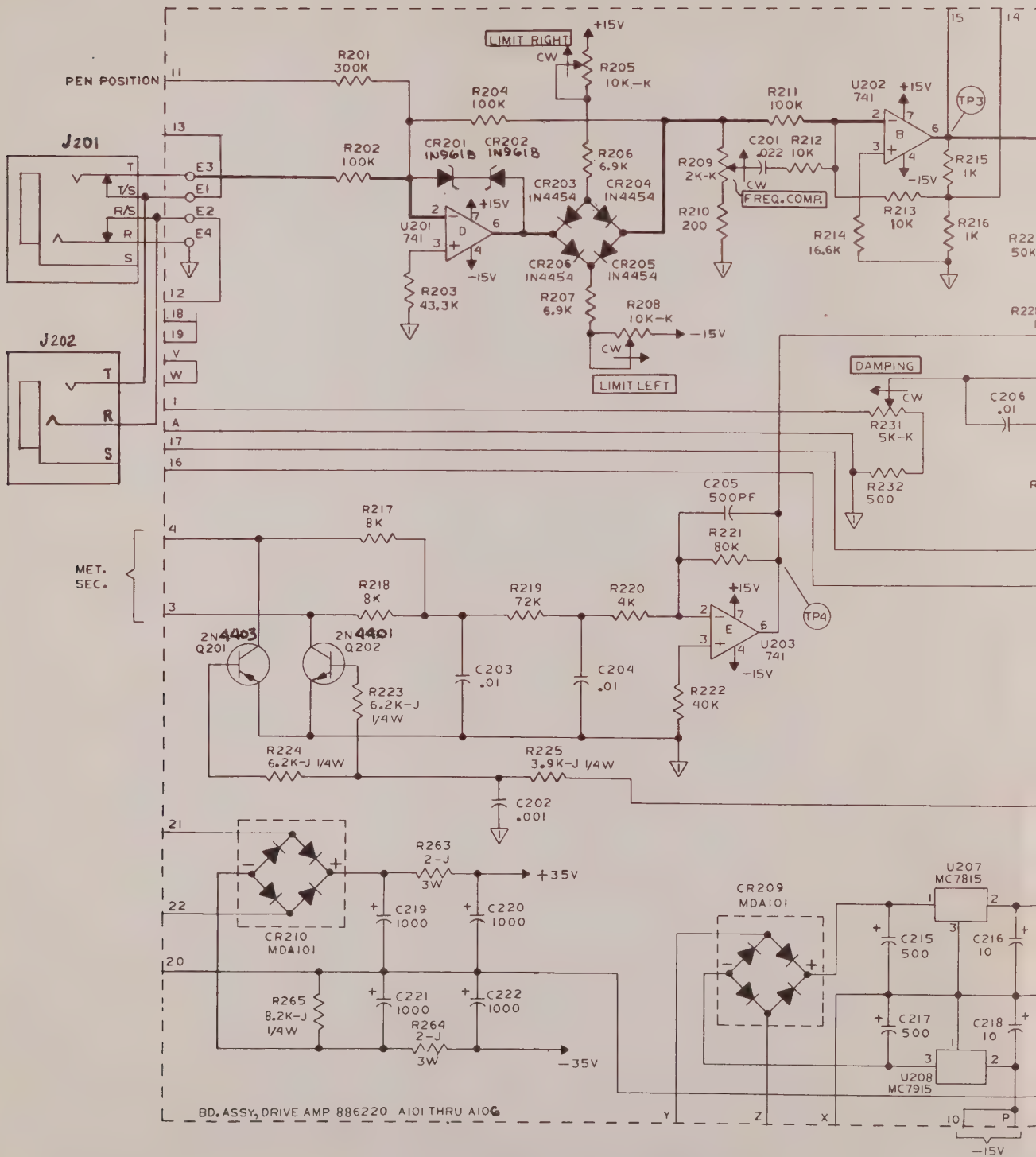
NAME SCHEMATIC 2000 SERIES

CODE IDENT. 96795 ISSUE CODE G

Gould Inc.
Instrument Systems Division
Cleveland Ohio 44114 U.S.A

DWG. NO. 285851

PG. 2 OF 4



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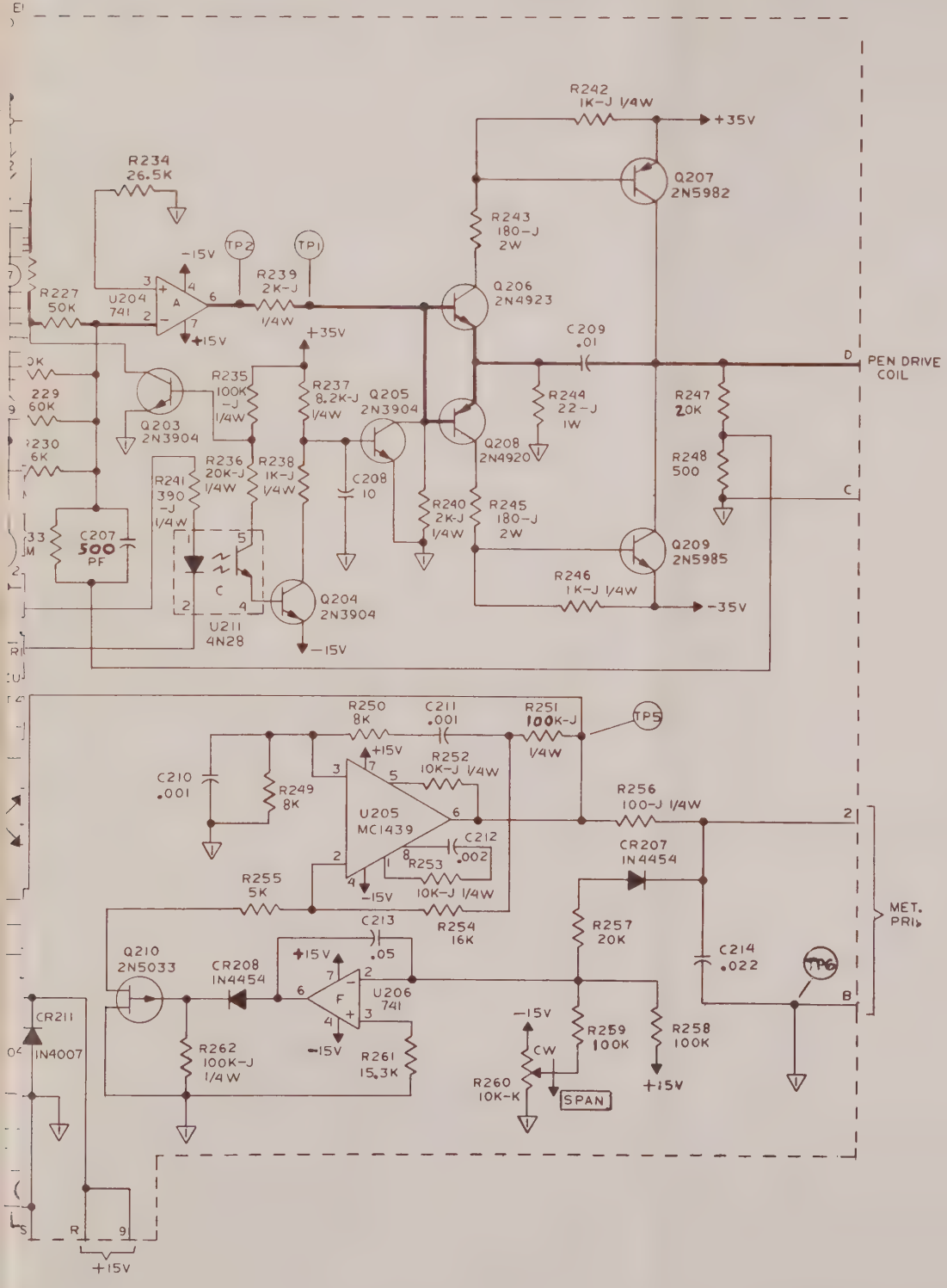
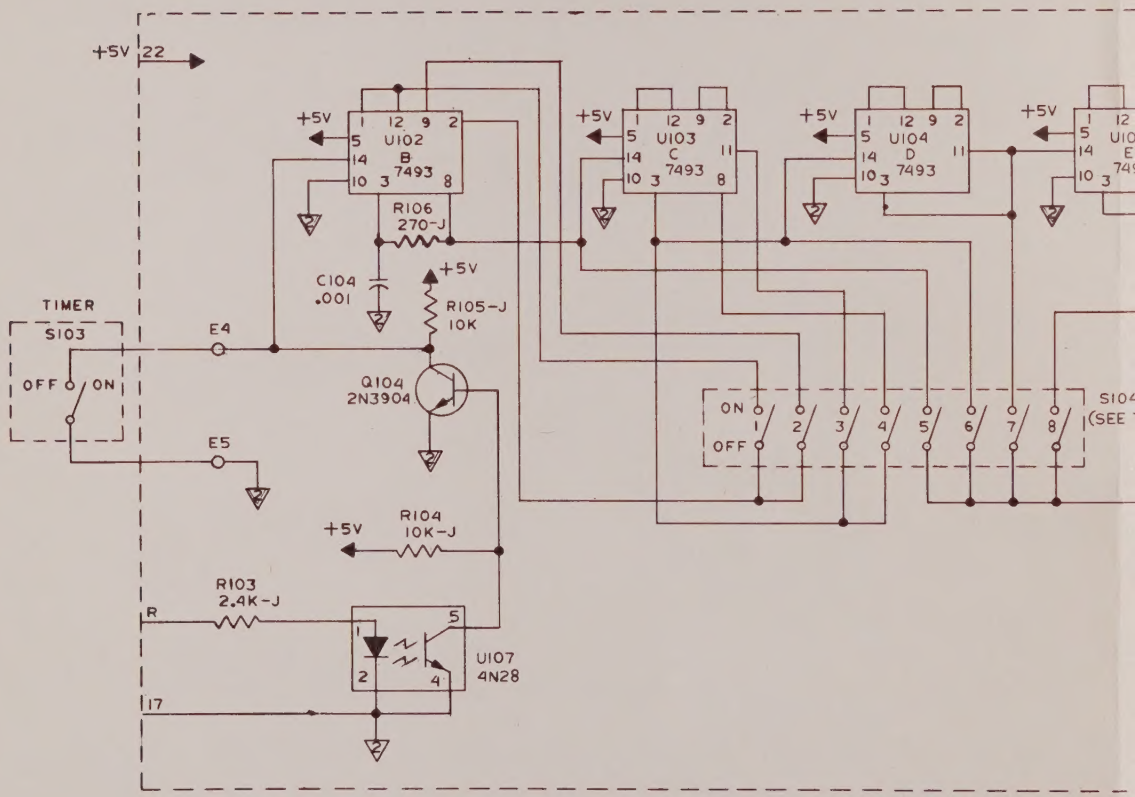
REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL



RECORDER ASS'Y.

BY	DATE	NAME	Gould Inc. Instrument Systems Division Cleveland, Ohio 44114 U.S.A.
DR D. CZECH	9-10-74	SCHEMATIC 2000 SERIES	
CH		CODE IDENT. 96795	ISSUE CODE G
APP McNeill	9/12/74		DWG NO. 285851

PG. 3 OF 4



S104 SW. SETTINGS FOR VA			
LINE FREQ.	50 HZ		
REP. RATE	SW ON	SW OFF	SW
.1 SEC	1 3 5	2 4 6 7 8	2 3
1.0 SEC	1 3 6	2 4 5 7 8	2 3
10.0 SEC	1 3 7	2 4 5 6 8	2 3
100.0 SEC	1 3 8	2 4 5 6 7	2 3
.01 MIN	1 4 6	2 3 5 7 8	2 4
.10 MIN	1 4 7	2 3 5 6 8	2 4
1.0 MIN	1 4 8	2 3 5 6 7	2 4

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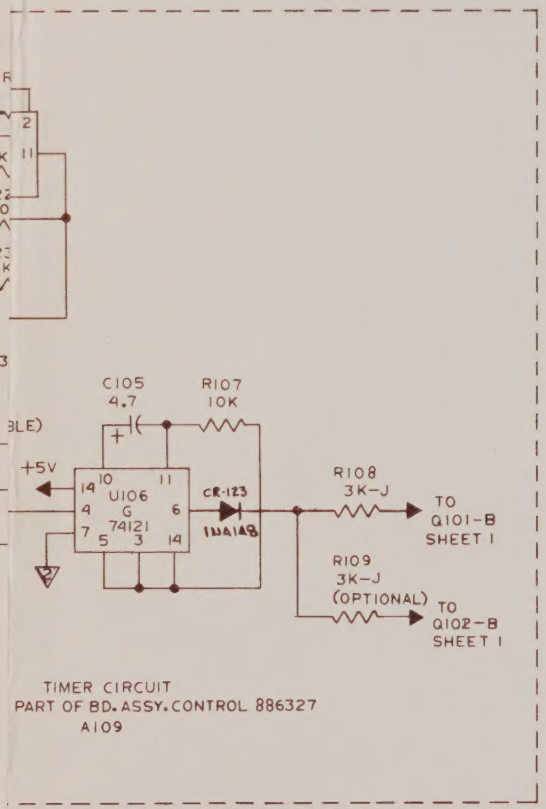
REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVAL



TIMER CIRCUIT
PART OF BD. ASSY. CONTROL 886327
A109

OUS REPETITION RATES

	60HZ								400 HZ							
	SW OFF						SW. ON		SW OFF							
	1	4	6	7	8		3	6	1	2	4	5	7	8		
	1	4	5	7	8		3	7	1	2	4	5	6	8		
	1	4	5	6	8		3	8	1	2	4	5	6	7		
	1	4	5	6	7		—		—							
	1	3	5	7	8		4	7	1	2	3	5	6	8		
	1	3	5	6	8		4	8	1	2	3	5	6	7		
	1	3	5	6	7		—		—							

RECORDER ASS'Y.

BY	DATE
DR D. CZECH	9-10-74
CH. Ignacio	9/12/74
APP. McNeill	9/12/74

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